or more, I think that that's very likely to represent some underlying tissue damage. * * * (Tr. 1563).

Peter Boyle, former professor of orthopedic physical therapy, agreed:

A large amount of force in a short time could create a pathoanatomic injury causing disruption, and [tissue] failure (Tr. 2797–98).

In addition, persistent signs and symptoms can themselves be severe enough to interfere significantly with major life activities (Tr. 13356. 13360, 13373). Dr. Connell testified:

A typical carpal tunnel patient would come in complaining of numbness and tingling in the distribution of the median nerve. Typically it occurs initially at night and wakes one out of a sleep for some reason—4 a.m. seems to be the magic number (Tr. 2817).

Moreover, the persistence of signs and symptoms can be an indication that an MSD is worsening, and early detection and intervention are ''critical to prevention of more serious disorders,'' in the words of Dr. Robert McCunney, president of the American College of Occupational and Environmental Medicine (ACOEM) (Tr. 7660). Dr. Marc Connell, an orthopedic surgeon at Georgetown University Hospital, added: ''I think that's common medical sense that the earlier the treatment is rendered the less severe will be the MSD'' (Tr. 2833). Dr. Edward Bernacki, vice-president of ACOEM, said:

Obviously, the earlier you pick up a problem, the more reversible it is, so obviously, the encouragement of employees to come in at the first signs of a problem, so that we could work it up, and then basically start treating the illness when it is reversible, in other words, if you have irreversible nerve damage, that is basically too late. Then, you need surgical intervention. However, for example, in carpal tunnel early on when the disease is reversible, mere splinting and restriction of activities are fine, it takes care of the problem, it disappears (Tr. 7687–88).

(See also Exs. 26–1367, 32–450–1, 37–24, Tr. 1530, 1697–98, 2853, 2833, 7649–50, 7687–88, 7883–84, 9831.)

In addition to reducing the severity of MSDs, early intervention has been shown to reduce MSD rates and associated medical costs (Exs. 32–12, 32–339–1–87, 32–399–1–4, 32–450–1 (citing Hales *et al.* 1993)). Dr. Bernacki described a study of the effect on 22,000 employees at Johns Hopkins Hospital and University of an ergonomics program that stressed early reporting of MSD signs and symptoms (Ex. 32–399–1–4, Tr. 7691–92). The study reported an 80 percent reduction in MSDs after the program and early intervention were implemented.

Early intervention also increases the availability and effectiveness of conservative therapy. Several HCPs told OSHA that, when MSDs are treated early, symptoms ''have been completely resolved with a brief period of restricted work activities'' (Ex. 37–12, Tr. 13345–46). Dr. Harrison said:

Employees often rapidly and completely recover from their MSD with simple modification of the work process or change of job duties to minimize or reduce exposure to ergonomic risk factors (Ex. 37–12, p. 5).

Dr. Franklin added that where employees with carpal tunnel syndrome are provided with early intervention they should be able to return right away to modified work and that work restrictions should not be needed for a prolonged period of time (Tr. 13345–46). Dr. Bernacki testified that, as a result of the early reporting and intervention program at Johns Hopkins, there had been only one surgery for work-related carpal tunnel syndrome during the past 5 years, compared with 26 such surgeries in the previous three years (Exs. 32–399–1–4, p. 7–8).

Early intervention also is likely to be more effective in helping patients recover fully (Exs. 37–12, 38–222, 38–451, 500–71–57). Dr. Harrison said:

At an early stage of symptom management, treatment with anti-inflammatory medications, splints, and rest of the affected body part often results in complete clinical improvement without any permanent injury (Ex. 37–12, p. 5).

Dr. Michael Erdil, medical director of the Connecticut Occupational Health Network, said that both scientific evidence and his own clinical experience show that conservative therapy is much more likely to be effective as an early intervention (Ex. 37–16, citing Kruger *et al.* (1991) (Ex. 26–910), Gelberman *et al.* (Ex. 26–916) (1980), Quebec (1987), Zigenfus *et al.* (2000) (Ex. 38–285). Zigenfus found that patients with low back injuries who were provided with medical treatment earlier (*i.e.,* less than 8 days after injury) required fewer days away from work and restricted work and had shorter case duration (Ex. 38–285). Dr. Evanoff explained that the medical literature consistently shows that:

[C]onservative management of MSDs is most effective when begun in early stages of these disorders, and that patients who are treated only after a prolonged symptomatic period are less likely to respond favorably than those treated earlier (Ex. 37–1, citing Dellon (1989), Stern (1990), Rystrom & Eversman (1991)).

Similarly, Dr. McCunney of ACOEM testified that:

ACOEM supports the requirement of a mechanism for employees to report MSD signs and symptoms since early detection is critical * * * [M]y colleague and I can regale you with all sorts of anecdotes about people who have waited too long to seek medical treatment, and then once they come for medical treatment, the treatment is not as effective as it could have been were they to have come earlier (Tr. 7649–50).

Dr. Harrison discussed the case of one worker who did not receive early intervention:

[A] twenty-five year old machine operator recently came into my office for treatment of severe hand pain and swelling. She had worked 9 months in a job that required her to use excessive force to press a lever over 20,000 times per day, using her hands in a pinch grip with her wrist in an awkward posture. She had developed symptoms after three months of work, but had not seen a health care provider after her supervisor told her that she would ''feel better'' after she ''got used to the job.'' By the time she finally came to see me, she was unable to drive her car, shake my hand or open a door. My examination showed marked swelling and redness of the right wrist, and the pain was so severe she cried [at] my touch or gentle movement. My diagnosis was chronic, stenosing tenosynovitis. I had little option but to remove her from work completely for four weeks to let the hand rest. Unfortunately, she was unable to return to work in spite of corticosteroid injections, splints, analgesic medication and physical therapy. She required surgery to release the tendon, and is now in a prolonged rehabilitation program.

This case is not unusual. (Ex. 37–12).

By including persistent signs and symptoms within the standard's definition of an MSD incident, OSHA assures that early intervention can occur and that medical outcomes like that described by Dr. Harrison will not occur.

For these reasons, a number of HCPs and employers said that they investigate MSD signs or symptoms as soon as they are reported (Exs. 30–390, 30–398, 500–218, Tr. 5539, 5550, 9906, 13382). Dr. Franklin stated:

If I was taking the history from the person and getting these kinds of symptoms of numbness and tingling and burning particularly at night, it would not matter to me whether it was two days or seven days or 14 days, if I thought clinically the symptoms were correct. I have seen patients that developed [carpal tunnel] in a day or two (Tr. 13382).

Several employers said that their standard response is to investigate any report of MSD signs or symptoms (Tr. 5539, 5550, 14715–16). Sean Cady, of Levi Straus & Co., said:

Well we believe that symptoms could be precursors to a possible repetitive motion injury. And therefore if we know about a symptom early we can evaluate a job for ergonomic risk factors and possibly modify that job to reduce risk factors prior to the

possible occurrence of an injury. And also, early reporting of symptoms is a trigger for our quick response system or quick response process (Tr. 14715–16).

Some employers provide restricted work when an employee reports MSD signs or symptoms to let the symptoms resolve quickly without medical treatment, and to allow the employer to examine the job (Ex. 26–1370). Other employers said their standard practice is to send any employee who reports MSD signs or symptoms to an HCP immediately (Tr. 3867).

These employers told OSHA that their early intervention programs, particularly restricted work and light duty, have proven to reduce the severity and costs of MSDs significantly (Ex. 30-4137). Even after the rule becomes effective, OSHA believes that employers who have seen the advantage and effectiveness of such intervention programs will continue to follow them rather than delaying intervention while they wait to see whether the employee's MSD signs or symptoms persist. However, for those employers who have not yet implemented early intervention programs, including the persistent signs and symptoms criterion in the final rule will help to ensure that employees are provided with appropriate MSD management and work restrictions while their condition is still reversible.

This evidence is part of the reason that OSHA does not agree with the commenters who argued that signs and symptoms are too subjective and difficult to verify to be an appropriate trigger for action under this standard (Exs. 30–1722, 30–3345, 30–4340, 500–1–23, 500–1–117, Tr. 5507). Other evidence establishes that MSD signs are often easily observable (Tr. 2828). For example, an employee's decreased range of motion can be identified by the employee's inability to raise his arms above his shoulders or to bend over to lift an object. Objective physical findings also include positive results on medical tests such as nerve conduction velocity tests, CT scans, or x-rays.

The presence of MSD symptoms can also be confirmed through physical examination by an HCP (Ex. 37–12, 37–28, Tr. 13404). Dr. Robert Harrison testified that there are several ways to confirm the presence of both MSD signs and symptoms, including palpation or movement of the affected body part during the physical examination (Ex. 37–12). Dr. Gary Franklin, of the University of Washington School of Public Health and Community Medicine, testified that symptoms of carpal tunnel syndrome, for instance, can be verified through absence of reflexes and nerve conduction tests and even the Katz hand paint diagram (Tr. 13380, 13404). According to Dr. Franklin, the best case definition of carpal tunnel syndrome is the presence of symptoms plus a positive nerve conduction test. However, Dr. Franklin also said that in some circumstances HCPs can reliably determine, based on symptoms alone, whether a patient has carpal tunnel syndrome: ''one could make a reasonable determination based on symptoms alone if you thought it was possible that somebody had carpal tunnel syndrome.'' (Tr. 13384–88). Dr. Margit Bleecker, Director of the Center for Occupational and Environmental Neurology at Johns Hopkins University, testified:

> I think as somebody who has worked many years in this area, you certainly can diagnose carpal tunnel syndrome by the history and the physical examination. The only time that you absolutely need to have the EMG is if you're considering surgery (Tr. 16901).

Dr. George Piligian, who is with the Mount Sinai Center for Occupational and Environmental Medicine and for the past 10 years has been treating workers with MSDs, added:

> We use principles in medicine, and as you may or may not know, 80 percent of medical diagnoses, all medical diagnoses, not just work-related ones, are arrived at by history and complaints. Then, we add to them, the physical diagnosis, and finally, the testing. This has been the way medicine has gone on for ages, and those who have written the most respectable textbooks say that, and many doctors who go right to the objective number, which they worship, and leave out those 80 percent arrive at the wrong diagnosis, and thereby give the wrong treatment. So, it is still seeing, listening, recording, putting it all together that arrives at the medical diagnosis, and they can be arrived at (Tr. 7851–52).

OSHA has, however, responded to the comments that certain MSD signs, such as redness, may be transient or may be a sign of something other than an MSD (Tr. 5507). As mentioned, in this final rule, MSD signs are treated the same way as MSD symptoms, so that only those signs that persist for 7 days after being reported to the employer or that meet the other severity criteria require further action. The proposal would have required action whenever an employee reported an MSD sign because all positive signs must be recorded under OSHA's recordkeeping rule. OSHA has also eliminated the reference in the proposal to Finkelstein's, Phalen's and Tinel's tests as examples of the kinds of positive tests that would constitute MSD signs. The record shows that these tests are not considered reliable by a growing number of HCPs and, in any event, have been replaced with other medical tests such as nerve conduction tests (Ex. 37–2, Tr. 13363, 13375).

Other differences between the proposed definition of a ''covered MSD'' and this final standard's definition of an ''MSD incident'' further show OSHA's intent not to address the type of minor and transient symptoms that can be expected to resolve spontaneously in a matter of days even without intervention. The final rule, unlike the proposal, does not include the diagnosis of an MSD in the definition of MSD incident. As mentioned, the standard also now makes clear that an MSD is not work-related unless workplace exposures caused or contributed to it, or were responsible for a significant aggravation of a preexisting injury. These changes respond to comments that the proposal could have required a full ergonomics program in situations where workplace exposures contributed only trivially to the employee's condition (Exs. 30–1722, 30–3934, 30–3956, 500–73, Tr. 3097–98).

Clearly, MSDs qualifying as MSD incidents under the definition in the final rule are the types of conditions that OSHA may act to prevent. See Occupational Noise Exposure (29 CFR 1910.95, 46 FR 46236), Occupational Exposure to Formaldehyde (29 CFR 1910.1048, 52 FR 46168, 46234–37), and Section VII (Significance of Risk) of the Preamble. It is even more clearly within OSHA's authority to require employees to investigate them further to determine whether they were caused by hazards that this standard addresses.

Paragraph (f)—How Do I Determine Whether the Employee's Job Meets the Action Trigger?

Paragraph (f) tells employers how to determine whether a job where an MSD incident has occurred meets the standard's two-part Action Trigger. According to paragraph (f)(1)(i), the first part of the Action Trigger is a determination that an MSD incident has occurred. Paragraph (f)(1)(ii) states that the second step is a determination that the injured employee's job meets the Basic Screening Tool in Table 1 of this standard. Paragraph (f)(2) explains that if the job does not meet the Action Trigger, the employer has no further obligations with respect to that job.

The second step of the action trigger requires application of the Basic Screening Tool in Table 1 to the injured employee's job. A job is screened in, *i.e.,* is determined to meet the levels in the Basic Screening Tool, if it regularly involves exposure to one or more of the risk factors in the Basic Screening Tool at levels above those specified in the tool. Only where the job is screened in

does the employer have further obligations under the standard.

The proposed rule also included an exposure screen. The proposed screen would have ruled out jobs where the ''physical work activities and conditions'' in the job were not associated with the ''type of MSD reported,'' or were not ''reasonably likely'' to cause or contribute to an MSD. It also would have ruled out jobs in which the employee's exposure to the risk factors was not a ''core'' element of his or her job, or did not make up a ''significant'' amount of the employee's workday.

Thus, the proposed standard contained performance-oriented language (''core element,'' ''significant amount'' of time) to define the terms of the screening criteria. In the preamble to the proposal, OSHA also used performance-oriented language in discussing the meaning of core element, describing the term as a ''regular and routine exposure.'' On the whole, most commenters supported the concept of an exposure screen, but many said that OSHA had not provided enough guidance for them to understand when a nexus existed between an MSD and a job or what the exposure severity threshold was for a job. For example, they complained that the terms were too vague and undefined to answer those questions (see, *e.g.,* Exs. 30–1722, 30–3032, 30–3853, 30–3956, 30–4340, 30–4837, 31–92, 31–125, 31–223, 31–225, 31–260, 31–307, 30–300, 32–337, DC66, Tr. 3337, 8849, 8850).

The following comments are representative:

> The terms ''core element'' and ''significant amount'' are not clear. While extreme examples can be easily defined, extreme examples are few and far between in the real world. Most of the time, examples fall into ''grey'' areas. These terms either need specific definitions or should be replaced with other terms (Ex. 30–4837).
>
> Does [core element] indicate that the employee will be required to perform a manual handling task some time during his/her shift, *i.e.,* one 50-lb. Lift throughout an 8-hour work shift, or does it indicate that some repetition is involved with the manual handling portion of the task, *i.e.,* lifting 20 10-lb. packages per hour for 8 hours? (Ex. 30–4837).
>
> How much is significant? 6 hours per 8-hr shift? 4 hours per 8-hr. shift? 2 hours per 8-hr. shift? Or 22-hr. periods per 8-hr. shift? (Ex. 30–4837).

The Rohm and Haas Company said:

> [I]t is unclear what OSHA means by the subjective terms used as shown below. ''* * * significant amount of their worktime * * *'' * * * [and] ''* * * core element of the employee's job.'' It is unclear how OSHA would be able to determine consistently the applicability of the standard in specific situations in the absence of a criteria to guide decision-making on whether the work time was significant, the applied force was forceful, or whether the material handling was a core element of the employee's job. * * * In the absence of an explanation of what OSHA intends these subjective terms to mean, it is unclear how to decide whether a particular activity fits the definitions and therefore whether it is covered by the standard. (Ex. 31–289)

National Small Business United testified that:

> The employers, especially the smaller employer, * * * needs more specific guidance in terms of the types of jobs to be looking at and specifically as the types of activities in those jobs and how much of what kind of activities is too much for what type of person. (Tr. 2746)

Con Ed stated:

> Throughout the standard, OSHA uses terms that are vague and open to interpretation such as: reasonably likely, core job element and other similar terms. These terms require clarification so OSHA and employers interpret them consistently. (Tr. at 4628)

In addition, ORC added that:

> The proposed trigger simply does not fulfill OSHA's responsibility to provide adequate guidance with respect to employer's obligations. * * * OSHA must do a better job of defining a point at which an employer's obligations are triggered and do a better job in establishing more objective criteria. (Tr. at 4097)

Similar comments were submitted by EEI (Ex. 32–300–1); Chamber of Commerce (Ex. 500–188; Tr. at 3044), Color Works (Tr. at 10069), Indiana Chamber of Commerce (Tr. at 3335), National Roofing Contractors Association (Tr. at 4905), Food Distributors International (Tr. at 5634–35), and many others.

Commenters further recommended that the screening criteria should include specific, exposure-based criteria (Ex. 500–218; Ex. 500–214, Tr. at 17905–6). In particular, ORC stated that:

> In place of the proposed screening criteria of section 902, OSHA would set forth flexible, but objective, risk-based criteria * * * (Ex. 500–214)

ORC added that such criteria are already contained in the record and that ''a number of models to define at-risk conditions and work routines are available in the literature and are cited by OSHA in its preamble.'' (Ex. 32–78–1)

Similarly, the AFL–CIO stated:

> While we believe the content and intent of OSH's proposed screening criteria were clear from the text and Preamble of the proposed rule, the AFL-CIO has several recommendations for ways in which OSHA can respond to industry's requests for more specific guidance and definitions. We recommend two possible approaches. The first is to incorporate a list of risk factors and criteria similar to the ''caution zone job'' criteria included in the state of Washington's Ergonomic Standard (WAC 296–62–0515) which serve a similar purpose as the screening criteria in the federal OSHA proposal. These ''caution zone job'' criteria provide more specific definitions of risk factors and the amount of time or frequency that must be exceeded for these risk factors to be covered by the standard. (Ex. 500–218)

ORC also expressed qualified support for using the state of Washington's ''caution zone job'' criteria:

> Although the Washington State proposal itself contains significant deficiencies, ORC believes its approach to providing quantified alternative triggers is a rational one that could be considered by OSHA. (Ex. 32–78–1)

See also Tr. 9071–74.

A preliminary exposure-based assessment as a trigger for further actions is also widely used by participants in the rulemaking who provided testimony on the specifics of their own ergonomics programs (see, *e.g.,* Ex. 32–300–1, Tr. at 2920–2927; Tr. at 5302, Tr. at 10802; Tr. at 14142; Ex. 32–339–1–4, Tr. at 16839; Tr. at 4643–4647; Tr. at 5539–5540, 5566–5567, Tr. at 14801; Tr. at 14715). Many of these commenters use a checklist format which contained specific descriptions of risk factors. The Dow Chemical Company, for example, uses a short checklist printed on a pocket size card that contains descriptions of specific risk factors along with a duration/timing component (see, *e.g.,* Tr. 5311–5312, 5359, Ex. 32–77–2–1). NIOSH's Elements of an Ergonomics Program (Ex. 26–2), also contains checklists that have specific descriptions of risk factors, some with a duration component.

A number of other participants also suggested that OSHA adopt quantitative methods of defining the screen (Ex. 30–46, 30–75, 30–137, 30–293, 30–328, 30–3032, 30–3284, 30–4837, 31-23, 31–27, 31–95, 31–137, 31–187, 31–31–202, 31–301, 31–307, 31–337). Specific suggestions included defining a core element of manual handling jobs in terms of frequency rates for lifts (Ex. 31–337), or saying lifting was a core element of a job that required one lift per hour (Ex. 31–259). Suggestions for a definition of the term ''significant amount of worktime'' included 50 percent or more of the employee's worktime, Southern California Edison (Ex. 31–23), more than 2 hours a day, UNITE (Ex. 32–198), or routine performance of the same task 4 hours or more per shift or 2 hours or more

continuously per shift, Monsanto (Ex. 30–434).

Some commenters thought that the screen would require them to conduct a job hazard analysis every time an MSD was reported, just to know whether the MSD was reasonably likely to have been caused by the job. Rodney Smith of Freeborn & Peters said:

> Identifying ergonomic risk factors is difficult due to the vagueness of their definition [in the proposed rule]. But how in the world does my employer tell whether those risk factors constitute a hazard, as that term has been defined in the standard. That is, risk factors reasonably likely to cause or contribute to a covered MSD (Tr. 8850).

Others also complained that it would be virtually impossible for them ever to establish that it was not reasonably likely that exposure to risk factors in a job could cause MSDs, when at least one MSD would have already occurred (Ex. 30–1722, 30–4137, DC 65). In addition, several commenters found the crucial terms ''extremely subjective,'' and believed they would be ''open to the individual interpretation of OSHA inspectors'' (Ex. 30–3032, 31–22, 31–303, 31–307, 32–337).

In response to those and other comments, OSHA has further clarified and operationalized the proposed exposure screen, or severity threshold. Once the employer determines that an MSD incident has occurred in a job, the employer must screen the job to determine whether it meets criteria requiring a job hazard analysis to determine the potential hazard associated with exposure to risk factors. For ease of use, the criteria are presented in a ''Basic Screening Tool,'' which is a chart that contains specific descriptions of the risk factors covered in the final rule along with duration specifications and illustrations (see Table 1 of the regulatory text). In jobs where an MSD incident has occurred and employee exposure to risk factors meets the criteria laid out in the screen, the employer must proceed with the program requirements in paragraph (g) of the standard.

Employers with employees who report MSDs in jobs that do not meet the specific screening criteria are not required to proceed with any of the remaining requirements of the standard. This could include jobs that do not involve the risk factors this standard covers or where the injured employee's work activities do not involve the injured body area. The screen also allows employers to screen out jobs in which the employee's work activities do not involve enough exposure to risk factors to require further action under this standard. In these cases, the employer need not perform a job hazard analysis, eliminate or control any MSD hazards, or provide training or MSD management. Where application of the screening tool results in a job being screened in, however, employers must implement the ergonomics program described in paragraph (g).

The Basic Screening Tool has been designed to minimize employer burdens in screening jobs. It is similar to a number of screening tools that are already in use (Exs. 26–1008 (Snook Push/Pull Tables), 32–77–1–2 and Tr. 5336–37 (Dow Chemical), 502–12 (NIOSH Lifting Equation), 502–35 (GM–UAW checklist)). It is limited to five risk factors and, to streamline the screening process, the tool applies the same duration criteria to almost every risk factor/activity.

The Basic Screening Tool in the final standard serves the same function as the screen in the proposed rule, but, instead of performance language, it contains specific definitions of the risk factors and exposure durations that define a job requiring further analysis. The definitions used in this chart are consistent with a number of approaches and screening tools contained in the rulemaking record, including the state of Washington's Ergonomic Standard's ''caution zone job'' checklist (Ex. 500–41); the checklists contained in the NIOSH Elements of an Ergonomics Program (Ex. 26–2); the checklist developed by tripartite committee of employer, employees and government representatives for use in conducting a preliminary job analysis under the British Columbia Ergonomics Standard (Ex. OR–388); and others (Exs. 500–108; 32–77–2–1, 26–2, OR–348–1; 502–67)

By utilizing language from programs and checklists that have been used successfully by both employers and employees for many years, OSHA fully anticipates that employers will have no difficulty in determining whether a job meets the standard's Action Trigger. Further, as with the proposed rule, OSHA expects that employers will be able to determine, quickly and efficiently, if the job activities of any employee reporting a MSD meet or exceed the criteria of the screen.

Similar to the concept expressed in the proposed rule, the basic screening tool in the final standard, when coupled with the occurrence of an MSD incident in a specific job, represents an exposure-based ''action trigger'', that requires the employer to proceed with some other provisions of the standard (in particular, job hazard analysis and MSD management). However, jobs where the employer has determined that an MSD incident occurred and that meet the screening criteria do not necessarily require corrective action; the need for corrective action is based on the results of a more detailed job hazard analysis (see Summary and Explanation, Job Hazard Analysis section). In this way, the screening criteria concept is similar to action levels contained in OSHA's health standards (*e.g.*, Benzene, 29 CFR 190.1028; Ethylene Oxide, 29 CFR 1910.1047; Formaldehyde, 1910.1048.) In those standards, as in the final ergonomic program standard, the inclusion of an action level is used to differentiate between more hazardous and less hazardous work operations, and to identify those operations where the employer needs to focus resources.

The screening criteria in the final standard consist of the five risk factors that are covered in the final rule: repetition, force, awkward postures, contact stress, and vibration. Most of the screening tools submitted to the record contained similar risk factors. For example, the screening tools submitted by NIOSH (Ex. 32–30–1–45), UFCW (Ex. IL–228), the AFL–CIO (Ex. 500–71–70), the Worker's Compensation Board of British Columbia (Ex. 500–142–12), the UAW/General Motors (Ex. Or 348–1), Dow (Ex. 502–77–2–1), and the Washington State Department of Labor and Industries (Ex. 502–313–6) included these same five risk factors as specific risk categories in their screens or included narrative questions directly related to or incorporating these same risk factors. In addition, these are the risk factors addressed in the epidemiological literature on ergonomics and discussed in the Health Effects section (Section V) of this preamble.

The proposal also included static postures, whole body vibration, and cold in the list of risk factors. The evidence discussed in the Health Effects section of this Preamble has convinced OSHA that these risk factors should no longer be addressed independently. Static postures will be covered to some extent by the awkward postures element of the screen, and employers should be aware that cold temperatures may aggravate the effects of other risk factors.

To give further guidance to employers, each risk factor in the chart is clearly described (*i.e.,* descriptions of specific job or task activities) and includes specific duration, frequency. and magnitude components. In the chart, repetition includes a separate description for keyboarding/mouse use; force is broken down into lifting, pushing/pulling, and pinching and gripping unsupported objects of specified weights; awkward postures are defined by specific postures, as well as

pictures; and vibration includes a description for both high vibration levels from equipment such as chainsaws, and moderate vibration levels from equipment such as jigsaws, grinders or sanders.

In addition, the chart contains a simple grid for employers to use in relating the body area affected by an MSD incident to a relevant risk factor. Thus, the grid serves to further simplify this initial determination by assisting the employer in focusing on only those risk factors that have a clear nexus with the MSD incident that triggered the use of the screening tool; this also reflects OSHA's intent in the proposal. For example, if an MSD of the back or lower extremity is reported, the employer, when evaluating the risk factor for repetition, would focus only on job or task activities where the employee is performing the same motions every few seconds or repeating a cycle of motions involving the affected body part more than twice per minute for more than 2 consecutive hours in a workday. The employer would not need to consider use of a keyboard and/or mouse in steady manner (the shaded portion of the chart under the risk factor repetition). Similarly, for a reported MSD affecting the back or lower extremity, the employer, when evaluating the risk factor for force, would only need to focus on job or task activities involving lifting or pushing/pulling and not on work tasks involving pinching or gripping.

Each job or task activity also includes a duration/frequency limit. In selecting the duration limit for the risk factors, OSHA based its decision on balancing the weight of the scientific evidence against the need for the screening tool to be clear and easy to use. For many items in the chart, the agency has chosen to use more than 2 hours total per day as an exposure duration that triggers jobs for job hazard analysis; this determination is based on an analysis of relevant epidemiological data contained in the rulemaking record.

Many studies in the epidemiological literature clearly demonstrate that the incidence of MSDs increase with increased duration of exposure to certain risk factors or a combination of risk factors. Table IV—SCREEN lists studies that included duration, either qualitatively or quantitatively, as a component of the investigation. These studies reflect a subset of the many studies identified by the Agency that demonstrate positive exposure-response relationships between the intensity and/or duration of exposure to biomechanical risk factors and the prevalence or incidence of MSDs. The results of these studies show increases in odds ratios or other risk measures with increases in the daily or weekly duration of exposure for a number of risk factors such as repetitive precision movements, awkward postures (*e.g.,* hands above the shoulders, kneeling, stooping), gripping, lifting, and carrying. For example, Ekberg *et al.* (Ex. 26–1238) reported that the risk of MSDs of the neck and shoulder increased with the hours per day that repetitive precision movements were performed and that arms were lifted above the head. Similarly, Kelsey *et al.* (Ex. 26–709) reported an increased risk of prolapsed lumbar disc when the frequency of lifting or carrying loads greater than approximately 25 pounds increased from 0 to more than 25 times per day. Similar dose-response observations were reported by Latza *et al.* (Ex. 38–424), Matsui *et al.* (Ex. 26–309), Smedley *et al.* (Ex. 500–41–40) and Tola *et al.* (Ex. 26–1018).

OSHA's review of the studies that quantified duration of exposure indicate that, in general, the MSD risk in exposed groups of workers increases above that in unexposed groups when the duration of exposure to certain risk factors or combinations of risk factors comprises about one-fourth to one-half of the workday or workweek. For example, Holmstrom *et al.* (Exs. 26–1231, 26–36) studied workers using awkward positions such as stooping, kneeling, and raising the hands above the shoulder and found an increased risk of low back pain (Odds Ratio of 1.4, 1.9, and 1.5 for stooping, kneeling and hands above the shoulder, respectively) with 1 to 4 hours per day of exposure. Similarly, Nordstrom *et al.* (Ex. 26–900) observed that the risk of carpal tunnel syndrome began to increase among workers whose jobs involved wrist bending or twisting after exposures of 3.5 hours compared to groups exposed for less than 3 hours (Odds Ratios of 1.34 with 0.25–1.75 hours exposure, 1.23 with 2–3 hours exposure, and 2.33 with 3.5–6 hours of exposure). Similar quantitative observations were reported by deKrom (Ex. 26–102) for wrist flexion, Baron *et al.* (Ex. 26–697) for grocery checking, and Xu *et al.* (Ex. 500–71–53) for frequent twisting and bending and for physically hard work (see Table IV—SCREEN). Other studies reported results using qualitative ordinal scales that indicate that risks increase, sometimes substantially, with exposure to risk factors of one-half a day or more. Ekberg *et al.* (Ex. 26–1238) reported ORs of 3.8 and 2.4 for neck/shoulder disorders that were associated with a ''medium'' duration (in hours per day) of repetitive precision movement or arms lifted, respectively, compared to workers with ''low'' exposure in terms of daily duration. Stetson *et al.*(Ex. 26–1221) found an increased prevalence (65%) of hand/wrist symptoms among workers using a high grip force (> 6 pounds) for more than half of a shift (defined as ''frequently'' in the study), compared to the prevalence in workers with ''some'' (40%) or no (41%) exposure. A study by Viikari-Juntura *et al.* (Ex. 500–41–50) of trunk twisting reported a non-statistically significant elevation in risk of neck disorders (OR = 1.3) among workers having ''little'' exposure (in hours per day), and statistically significant increases in risk among workers with ''moderate'' (OR=1.9) and ''much'' (OR = 2.3) exposure.

However, there were also studies that showed increased risk of MSDs associated with exposures of less than 2 hours daily. For example, Vingard *et al.* (Ex. 500–41–51) showed an increased risk MSDs of low back area among workers in jobs involving forward bending for approximately 1 hour per day (statistically significant for male workers, but not for female workers). Holmstrom *et al.* (Ex. 26–36) found a significantly increased OR (2.4) for severe low back pain with impairment for less than 1 hour per day of kneeling). DeKrom *et al.* (Ex. 26–102) reported a significantly increased OR (1.4) for carpal tunnel syndrome among workers having 1 to 7 hours per week of wrist flexion; 1 to 7 hours per week of wrist extension was also associated with an elevated OR for CTS (1.4), but that result was not statistically significant. Latza *et al.* (Ex. 38–24) reported an increase (not statistically significant) in low-back pain among workers laying sandstone for less than 2 hours per day compared to unexposed workers. English *et al.* (Ex. 26–848) found positive exposure-response relationships where ORs for carpal tunnel syndrome or hand/wrist disorders increased by 1.8 and 1.6 per hour worked per day, respectively, for workers performing tasks involving shoulder rotation once per minute. These studies, taken as a whole, demonstrate that for the risk factors listed in the basic screening tool, the risk of MSDs increased with daily duration of exposure.

The studies described above and contained in Table IV—SCREEN show that, where researchers have investigated relationships between MSD risk and daily duration of exposure, the risk of MSDs has been consistently elevated in groups of workers exposed for half of the workshift or more (Exs. 26–1238, 26–697, 26–1221, 38–428, 26–

1231, 26–36, 26–1018, 500–41–50, 26–102, 26–900, 26–58, 500–71–53). For exposure durations of one-fourth to one-half of the shift, or durations described as ''some'' or ''moderate,'' several studies showed statistically significant increases in MSD risk (*e.g.,* Exs. 26–697, 38–428, 26–1231, 26–36, 500–41–50, 26–102) and others reported increased ORs that were not statistically significant (*e.g.,* Exs. 26–1018, 500–41–50, 26–102, 26–58). For exposures of less than 2 hours daily duration, results from these studies are more equivocal; some reported significantly increased ORs (*e.g.,* Exs. 500–41–51, 26–848, 26–102, 26–36) while several found non-statistically significant increases in ORs (*e.g.,* Exs. 500–41–50, 26–102, 500–41–51, 26–36, 26–1231, 38–24). Based on these studies, OSHA finds it reasonable to trigger jobs for job hazard analysis where employees are exposed to the risk factors indicated on the screen for more than 2 hours during the work shift. OSHA believes that a 2-hour duration criterion for the screen will capture those exposure situations where the epidemiological evidence indicates that MSD risk is most likely to be elevated (*i.e.,* jobs involving more than 4 hours per day of exposure) as well as those jobs involving 2 to 4 hours of exposure during the shift where the evidence suggests that the risk may already be increased, at least in some situations. The 2-hour trigger will exclude those jobs where the evidence has been less consistent in finding an elevated risk of MSDs (*i.e.,* jobs involving less than 2 hours of exposure). This is consistent with OSHA's statutory mandate to be protective of workers. However, because the screen does not necessarily trigger an obligation to control a job, OSHA also is not imposing unnecessary costs on employers.

In using this 2-hour cutpoint, OSHA does not intend to imply that all workers will experience significant adverse effects after 2 hours or more of exposure. Rather, OSHA is using this cutpoint in the screen criteria to give employers guidance about which jobs might involve a sufficient duration of exposure such that the job warrants closer examination. In addition to being supported by the scientific literature, this value is also administratively simple for employers to use, thus allowing the screening tool to be used quickly and consistently for a number of different jobs.

For repetitive motion other than use of a keyboard or mouse, the screen triggers jobs into the requirements of the standard only if the exposure occurs for more than 2 *consecutive* hours in a workday, as opposed to more than two hours total per day. This reflects OSHA's belief, based on the health evidence, that 2 hours of repetitive motion will be less hazardous if spread out over the workday because musculoskeletal tissue will have an adequate opportunity to recover. By capturing only those jobs that involve more than 2 consecutive hours of repetitive motion, the standard will not capture those jobs where employees change tasks during the day, even if the repetitive motion occurs for a total of 2 hours over the work shift.

The screening tool departs from the 2-hour duration criterion for a few items. These include the following: For use of keyboard and mouse in a steady manner, the duration is set at 4 hours total per workday; for lifting, the screen sets weight and frequency criteria; and for use of tools or equipment that typically have high vibration levels (such as chainsaws, jack hammers, percussive tools, riveting or chipping hammers) the duration is set at 30 minutes total per day.

For use of a keyboard or mouse in a steady manner, OSHA has set the duration for more than four hours total per day. In this case, OSHA has chosen more than four hours based on the epidemiological evidence that demonstrates that, in general, the risk of MSDs for workers performing keying activities begins to increase after four hours of exposure (see Table IV—SCREEN). For example, Bernard *et al.* (Ex. 26–842) studied workers typing at video display units and reported an increased risk of hand/wrist MSDs for exposures of 4 four to six hours. Oxenburgh (Ex. 26–1367), observed an increased prevalence of hand, wrist, forearm and/or elbow MSDs after 4 hours per day at a keyboard. Similarly, Polanyi *et al.* (Ex. 38–3) studied keyboard workers and observed that upper extremity MSDs significantly increased after exposure durations of approximately four hours per day. Based on this evidence, OSHA has determined that it is appropriate to deviate from the 2 hour duration criterion set for other job or task activities, and to set a greater than four hours total per day for the use of a keyboard or mouse in a steady manner.

For using tools or equipment that typically have high vibration levels (such as chainsaws, jack hammers, percussive tools, riveting or chipping hammers) OSHA has set the duration at 30 minutes total per day. This level is based on a time-energy equivalent exposure determination. For example, the time duration for using tools or equipment that have moderate vibration levels (such as jig saws, grinders, or sanders) is set at 2 hours total per day. Vibration level can be expressed as the amount of energy transmitted by the tool over a certain period of time (*e.g.,* m/s^2). OSHA assumes that a moderate vibration level is approximately 2.5m/s^2. The duration for moderate vibration level is more than 2 hours total per day. Assuming that a high vibration level is approximately 10m/s^2 (4 times the moderate vibration), the time-energy equivalent exposure duration level at which risk is increased for activities involving high vibration levels would be 30 minutes (*i.e.,* ¼ of 2 hours). That is, risks for activities at four times the vibration level would occur ¼ the amount of time.

For lifting, the chart contains specific weight limits, coupled with a specific limit on the number of times per day the weight can be lifted. Weight limits are specified for weights lifted from below the knee, above the shoulder and at arm's length. The limits specified are as follows: lifting more than 75 pounds at any one time; more than 55 pounds more than 10 times per day; or more than 25 pounds below the knees, above the shoulder, or at arms' length more than 25 times per day. OSHA has based these limits on recommendation found in other screening tools as well as evidence in the epidemiological literature that shows increased risk of low back disorders when lifting certain weights at certain frequencies or postures. For example, Arad and Ryan (Ex. 500–41–7) and Smedley *et al.* (Ex. 1249) reported an increase in risk low back MSDs among healthcare workers lifting one to four patients per day. Kelsy *et al.* (Ex. 500–41–73) reported increased risks of lumbar disorder among workers in jobs requiring lifting more than 25 pounds more than 25 times per day compared to workers who did not lift these weight. Similar findings were reported by Macfarlane *et al.*(Ex. 500–41).

OSHA finds that the weight of evidence clearly demonstrates that heavy, frequent or awkward lifting increases the risks for MSDs. Particular studies, such as those described above, provide support for the specific weight criteria used in OSHA's screening tool for the final standard. Washington State has used similar data to support its ''caution zone job criteria'' for lifting (Ex. 500–313–6). OSHA believes that these are reasonable criteria to use for the screening purposes of this standard and that, in general, these criteria reflect the evidence in the record.

The exposure screen also contains an entry for activities involving pushing and pulling. In a questionnaire survey of insurance company policyholders,

Snook *et al.*(1978) found 9% of low back injuries to be associated with pushing and 9% to be associated with pulling (Ex. 26–35). NIOSH (1981) cited evidence that 20% of overexertion incidents involve pushing and pulling objects (Ex. 26–393). Thus, OSHA finds that it is appropriate to include pushing and pulling on the screen as a specific exposure criterion.

For job activities involving pushing or pulling, the chart specifies 20 pounds of initial force as the trigger criterion. To provide a basis for determining appropriate workloads for these activities, Snook and Ciriello (1991) developed tables of maximum acceptable forces for pushing and pulling (Ex. 26–1008). Maximum acceptable forces were expressed in terms of the percentage of the industrial population capable of performing the task. Data were presented separately for males or females either pushing or pulling, and were given for both initial forces (the force required to get an object in motion) and sustained forces (the force required to keep an object in motion). Variables included frequency, distance, and height (vertical distance from floor to hands).

The tables were developed based on experiments employing a psychophysical methodology (Ex. 37–6). This approach assumes that workers are able to determine with some accuracy their highest acceptable workload. Subjects were given a task with a set frequency, distance, and height and were allowed to control the amount of force used. Subjects were instructed to work as hard as they could without straining themselves or becoming unusually tired, weakened, overheated, or out of breath.

Although acute fatigue was the basis of the limitations established by this series of experiments, the results have been shown to predict the risk of developing MSDs. Snook *et al.*(1978) reported that workers performing manual handling tasks that less than 75% of workers are capable of performing without overexertion are three times more likely to suffer from low back injuries than those workers performing manual handling tasks that more than 75% of workers are capable of performing (Ex. 26–35).

Other research has also supported a relationship between psychophysically derived exposure levels and risk of MSDs. Using an index derived from the tables developed by Snook and applying it to 6,912 workers in 55 industrial jobs, Herrin *et al.*(1986) found that the number of overexertion incidents was related to the psychophysical stress of the job. The severity of these incidents as measured by lost or restricted work days was also found to be associated with psychophysical stress (Ex. 26–961). Additionally, Park and Punnett found psychophysical ratings of ergonomic stressors to predict the incidence of in-plant medical visits for MSDs among 1064 workers in two automobile manufacturing plants (Ex. 38–160).

Based on the reported association between pushing and pulling and the development of MSDs, and the evidence of a relationship between psychophysically derived exposure limits and reported injuries, OSHA concludes that an exposure criterion based on psychophysically derived limits will serve as a reasonable basis for determining when a hazard analysis is necessary for jobs involving pushing and pulling activities.

The 20-pound force criterion for pushing and pulling will capture all jobs that are designed such that less than 75% of workers (male or female) are capable of performing them without experiencing overexertion. As explained above, lifting jobs that cannot accommodate at least 75-percent of the working population's physical capacity have been associated with a three-fold higher risk of low back disorders. This suggests that jobs should be subject to more detailed hazard analysis if an initial screen indicates that a task involving pushing or pulling is not designed within 75-percent of the working population's physical capacity.

While the screening threshold for pushing and pulling forces is based upon an exposure level that is protective of 75 percent of the industrial population based on psychophysical measurements relating to overexertion, this should not be construed as an endorsement by the Agency of exposure to ergonomic risk factors based on what is considered to be an acceptable level for any given percentage of the population. The level chosen in this instance resulted from the fact that the evidence in the record indicates that an increased risk of developing MSDs exists among workers who perform pushing or pulling activities at levels above those found to be acceptable to 75 percent of the industrial population based on psychophysical measurements relating to overexertion, not because any particular proportion of the exposed population was considered to be protected from developing MSDs.

The 20-pound force criterion for pushing and pulling tasks is consistent with the OSHA ''safe harbor'' for pushing/pulling, which is based on the 90th-percentile values for female workers. Using 20 pounds as screening criteria will help to ensure that employers are not screening in jobs for which they have already implemented controls based on the safe harbor value, but instead are screening in those jobs where risks may begin to occur and for which a job hazard analysis is appropriate.

For performing activities that require pinching or gripping unsupported objects, the chart specifies weights of two pounds or more per hand for pinching and 10 pounds or more per hand for gripping. These values are generally supported by studies such as those by Chiang *et al.* (Ex. 500–41–25), Stetson (Ex. 500–41–44), English (Ex. 500–41–30) and Roquelaure *et al.* (Ex. 500–41–112). These investigators reported increased risks of carpal tunnel syndrome, thumb disorders, shoulder disorders, and nerve abnormalities among workers repetitively pinching objects approximately in the range of two pounds or gripping objects approximately in the range of 10 pounds. OSHA believes that the weights specified represent reasonable screening criteria for identifying conditions likely to cause the type of MSDs reported and are similar to values recommended in other screening tools. While there may be more precise ways of measuring force associated with pinching or gripping, OSHA believes that using the weight of objects handled is more administratively simple for employers to use and thus will enable employers to more quickly and consistently evaluate jobs.

Similarly for contact stress, OSHA has specified a frequency of 10 times per hour when using the hand or knee as a hammer. OSHA believes that this value is also administratively simple and reasonable to use for the screening purposes of this standard. Studies have shown increased risk in MSDs among workers using the hand or knee as a hammer (*e.g.,* Little and Ferguson, Ex. 26–1144 and Thun, Ex. 26–60). However, little data is available that quantifies the frequency of exposure at which increased risks are observed. Washington State chose a value of 10 times per hour for their ''caution zone job'' criteria. OSHA believes that this is a reasonable value to use for screening purposes and that it gives the employer guidance in identifying work activities likely to contribute to the type of MSDs reported.

In summary, the specific description of risk factors contained in the screen, coupled with the duration specifications, all have a sufficient degree of risk to trigger some simple additional requirements (job hazard analysis, MSD management, training and evaluation). It should be kept in

mind however, that these are not intended to imply that a hazard exists and requires control be instituted. There is substantial evidence in the record that supports the agency's choice of risk factors and duration levels. As with ''action levels''' contained in other health standards, the duration levels were set at levels where the risk begins to rise and additional, simple steps are necessary.

The purpose of this screen is to focus on those jobs that are likely to have caused or contributed to the MSDs that are reported. In general, activities causing or contributing to such MSDs are more likely to be ones that make up significant amounts of the employee's worktime and represent a core element of the employee's job. As such, these activities are likely to be a foreseeable part of the job that can be reasonably predicted and thus can be taken into account when designing an ergonomics program. These are the types of jobs that OSHA seeks to capture under the final standard so that programs can be put in place to prevent further MSDs from occurring.

In order to better enable employers to capture such jobs, OSHA is setting a minimum frequency for job or task activities that must occur as a part of the screening tool. OSHA is setting this frequency at one day per week or more. Obviously, there are numerous values that could be chosen. However, OSHA believes that this value can reasonably be used to determine those job or task activities that are core element of an employee's job, and are foreseeable or reasonably predictable. In addition, a frequency of once a week or more is likely to capture many work activities that are an element of an employee's job that occur on a weekly basis (*e.g.,* deliveries or maintenance activities). To meet the screen, a job must ''routinely'' involve tasks that meet the designated criterion at least one day a week. This value will also provide guidance in that it can be used to rule out job or task activities that are rare occurrences, that are not predictable, or that result from unusual work circumstances.

In conclusion, in response to the comments received on the proposed standard, OSHA has developed a screening tool that will provide employers with quantitative guidance for determining work activities and conditions that are likely to cause or contribute to MSDs and that are a core element of a job or make up a significant amount of the employee's worktime. This screening tool includes specific descriptions of tasks and durations that will enable employers to evaluate jobs, quickly and consistently, at their worksites. To the extent possible, these descriptions and durations were developed using to the extent possible using the best available epidemiological literature as well as expert opinion from other groups who have developed very similar screening tools. This screen is intended to be used in conjunction with the event of an MSD incident to identify work conditions where exposure risks may exist such that a job analysis must be conducted to determine whether job controls are quickly and consistently necessary.

Paragraph (g)—What Actions Must I Take if the Employee's Job Meets the Action Trigger?

Paragraph (g) of the final rule defines the actions that employers must take if an employee with an MSD incident is employed in a job that meets or exceeds the action trigger. The paragraph requires that the employer must either implement the Quick Fix option in paragraph (o) of the final rule, or develop and implement an ergonomics program that includes the following elements:

(i) Management leadership as specified in paragraph (h) of this section;

(ii) Employee participation as specified in paragraph (i) of this section;

(iii) MSD management as specified by paragraphs (p), (q), (r), and (s) of this section;

(iv) Job hazard analysis as specified by paragraph (j) of this section;

(v) Hazard reduction and control measures as specified in paragraphs (k), (l), and (m) of this section, and evaluations as specified in paragraph (u) of this section, if the job hazard analysis determines that the job presents an MSD hazard;

(vi) Training as specified in paragraph (t) of this section.

A few commenters suggested that the effectiveness of ergonomics programs in reducing workplace MSD hazards was not demonstrated for the proposed rule. For example, the post hearing brief submitted on behalf of the U.S. Chamber of Commerce stated:

> None of this ''evidence'' * * * begins to support the proposition that an Ergonomics Program Standard such as the one contained in the Proposed Rule will reduce at all the incidence of workplace musculoskeletal complaints. [Ex. 500–188]

In contrast, the use of ergonomics programs as an effective method for addressing workplace MSD hazards was endorsed by the vast majority of commenters in the rulemaking record (see, *e.g.* Exs. 30–3855, 32–185, 500–209, Tr. 4940, Tr. 1491). For example, Mr. McCauseland, representing the American Meat Institute (AMI), testified during the rulemaking hearing: So what has happened in the 10 years since the meat packing guidelines were issued? Well, a number of things. In our industry, reduced levels of injuries and illnesses have been approximately one third of all incidents. Nearly one-half of lost time incidents have been reduced as well. * * * The guidelines have fostered proactive efforts to eliminate ergonomic risks and hazards in a wide ranging number of applications [Tr. 4940].

A complete discussion of the widespread support for the proposition that ergonomics programs are effective is contained in Chapter III of the Final Economic Analysis for the final rule. In that chapter, OSHA discusses the history of successful ergonomics programs and describes the extensive use of ergonomic programs throughout broad sectors of industry. In fact, the number, longevity, and extensive use of ergonomic programs that are similar to those required by OSHA's final rule clearly validate the Agency's regulatory approach, as well as demonstrating the inherent feasibility of the standard for covered employers who establish such programs.

Many of these programs have most or all of the program elements required by paragraph (g) of the final rule. The wide use of these elements in current programs is evidence that employers believe them to be essential, workable concepts. The program elements contained in the final rule are summarized and explained in other sections of this preamble and therefore will be discussed only briefly here in the context of the overall program requirement.

Paragraph (g) of the final rule specifies that if an employee's job exceeds the action trigger, the employer may implement a quick fix option for that job under paragraph (o). An employer who qualifies for the quick fix option does not need to establish an ergonomics program, although he or she must follow all of the quick fix procedures. However, if the employer cannot or does not implement a quick fix, then the standard requires an ergonomics program with the following elements:

- Management leadership,
- Employee participation,
- MSD management,
- Job hazard analysis,
- Hazard reduction and control,
- Training, and
- Evaluation.

Management leadership is critical to the successful implementation and operation of ergonomics programs.

Management leadership provides the focus and direction of the program's effort as well as the needed resources in terms of both personnel commitment and funding. The requirements for management leadership are described in the summary and explanation for paragraph (h).

Employee participation is equally important. Employees are essential sources of information about MSDs, risk factors, and MSD hazards in their work areas. They have valuable insights into effective control measures that can be used to reduce risk factors inherent in their jobs. The requirements for employee participation are described in the summary and explanation for paragraph (i).

MSD management provides for prompt and appropriate management when an employee has experienced an MSD incident. MSD management includes access to a health care professional, work restrictions as needed, work restriction protection, and evaluation and follow-up of the MSD incident. MSD management is important largely because it helps ensure that employees promptly report MSDs and signs and symptoms of MSDs. This, in turn, ensures that jobs that present MSD hazards will be included in the ergonomics program. The requirements for MSD management are described in the summary and explanation for paragraphs (p), (q), (r) and (s).

Job hazard analysis provides for the identification of the risk factors for jobs that meet the action trigger. The job hazard analysis provides a systematic approach to identifying and addressing the risk factors in the job. The requirements for job hazard analysis are described in the summary and explanation for paragraph (j).

Hazard reduction and control is the heart of the ergonomics program. Under this program element, employers control the risk factors in problem jobs identified during the job hazard analysis. The requirements for hazard reduction and control are described in the summary and explanation for paragraphs (k), (l), and (m).

Training provides employees with the information and understanding that they need to participate effectively in the ergonomics program. In addition, the training required by the final rule provides the more detailed information that supervisors, team leaders and other employees involved in setting up and managing ergonomics programs need to carry out their program-related responsibilities effectively. The training requirements are described in the summary and explanation for paragraph (t).

Evaluation is the process employers use to ensure that the program they have established is functioning as intended. Employers are required to evaluate their programs every three years and at other times if they have reason to beleive that the program is not functioning properly. The requirements for program evaluation are found in paragraph (a).

In summary, ergonomic programs similar to OSHA's in structure have been effectively reducing the incidence and/or the severity of MSDs for at least 10 years throughout the vast majority of general industry sectors. Model programs that contain OSHA's program elements have been implemented by a wide range of employers, such as large and small manufacturing establishments, utilities, and government agencies (see, *e.g.,* Exs. 32–185, 500–108, 38–50, Tr. 4693, Tr. 5696, Tr. 6310, Tr. 5931, Tr. 7031, Tr. 7068, Tr. 7074, Tr.7918, Tr. 7934, Tr. 7937, Tr. 7963, Tr.7948, Tr. 7999, Tr. 8826, Tr. 14707, Tr. 17350)

Paragraph (h)—Management Leadership

Paragraph (h) contains the final rule's requirements for management leadership. It requires that employers assign and communicate responsibilities for setting up and managing the ergonomics program; provide the authority, resources, and information necessary to meet those responsibilities; ensure that existing policies and practices encourage and do not discourage reporting and participation in the ergonomics program; and communicate periodically with employees about the program and their concerns about MSDs.

Paragraph (h) of the final rule is nearly identical in content to the proposed management leadership section (Section 1910.912). OSHA has elected to retain the management leadership requirements as proposed due to evidence in the record that supports the need for management commitment in any effective ergonomics program. Minor changes have been made to clarify the provision regarding the assignment and communication of responsibilities and to allow for more concise application of the subelement relating to the encouragement of reporting and participation.

OSHA proposed to require management leadership because the literature on ergonomics programs consistently cites management commitment as a vital component of an effective program (see, *e.g.,* Exs. 2–13, 26–2, 26–5, 26–9, 26–10, 26–13, 26–14, 26–17, 26–18, 26–22, 26–27). The need for management commitment was also supported by a number of responses to the ANPR (see, *e.g.,* Exs. 3–27, 3–124, 3–173).

The elements of the proposed and final management leadership requirements are based on the concept of management leadership expressed in the literature. OSHA considers the proposed and final management leadership provisions to be necessary to the exercise of leadership of the ergonomics program.

Responses to the proposed management leadership provisions indicated general support for the concept of management leadership. Comment on the provisions pertaining to the assignment and communication of responsibilities; provision of authority, resources, and information; and periodic communication focused on the interpretation, rather than the concept, and often criticized the proposal as vague. Comments regarding policies and practices that discourage reporting and participation revealed sharply divided opinion on the merits of the proposed provision.

The importance of management leadership as a component of an effective ergonomics program was supported in a number of comments on the proposed rule (see, *e.g.,* Exs. 30–2387, 30–3745, 30–3765, 32–78–1, 32–85–3, 32–182–1, 32–198–4, 32–339–1, 30–428, 30–3860, 30–4333, Tr. 3479, Tr. 3565, 32–450–1–18–1, Tr. 8004, Tr. 1496, Tr. 9070). David LeGrande of the Communications Workers of America, for example, when asked to indicate what characteristics distinguished successful ergonomics programs from those that fail, explained that the commitment of management is the primary factor in determining if a program will succeed (Tr. 9018).

The inclusion of a distinct requirement for management leadership in the proposed ergonomics standard, however, was considered by some parties to be inappropriate (see, *e.g.,* Exs. 32–78–1, 30–2830, 30–3853, 30–3765, 32–368–1, 500–223, 30–3426). Mandating the assignment of responsibilities and provision of authority, resources, and information, it was argued, is so vague as to lead to uneven enforcement by OSHA personnel, according to these commenters (see, *e.g.,* Exs. 30–74, 30–240, 30–1336, 30–3284, 30–3336, 30–3344, 30–3367, 30–3763, 30–3782, 30–3849, 30–3951, 30–4496, 30–4674, 30–4837, 30–4247). The Ameren Corporation, for example, stated:

> Whether an employer has committed enough ''resources'', has ''ensured'' that they have encouraged their employees to report or participate, or is communicating often

enough are all highly subjective judgement calls which cannot be consistently made by OSHA (Ex. 30–4247).

Bruno's Supermarkets and others (see, *e.g.,* Exs. 30–2836, 30–2837, 30–2828, 30–2839, 30–2840, 30–2841, 30–2842, 30–2843, 30–2844, 30–2940) concurred with this assessment, stating:

[The proposed standard] requires that employers communicate ''periodically'' with employees about the ergonomics program. Suppose, for example, that an employer distributes an annual ergonomics bulletin. How will the employer know whether an OSHA inspector will expect us to communicate more frequently, such as once a week or once a month? This section also requires employers to provide those managing the ergonomics program with ''resources,'' which are vaguely and broadly defined as ''the provisions necessary to develop, implement, and maintain an effective ergonomics program,'' including money, etc. We may feel that we have provided adequate resources necessary for such an effort, but we will have no way of knowing whether the OSHA inspector will agree. The lack of objective, attainable standards will leave employers at the whims of OSHA inspection personnel. (Ex. 30–2836)

The term ''periodically'' was specifically cited by a number of parties as being unduly subjective and open to interpretation (see, *e.g.*, Exs. 30–1101, 30–1336, 30–3826, 32–337–1, 30–1671, 30–3336, 30–3367, 30–3782, 30–4674, 30–3512). Some commenters said that determinations about the delegation of authority and assignment of resources were outside of OSHA's expertise and created excessive administrative burdens on employers (see, *e.g.*, Exs. 32–78–1, Tr. 12250). Such mandates were believed by some to be beyond the Agency's authority (see, *e.g.*, Exs. 30–2914, 30–4335).

OSHA has decided to retain a requirement for management leadership in the final rule. Management leadership is widely believed to be one of the core elements of any effective safety and health (including ergonomics) program. If no individuals in a given workplace have been assigned responsibilities for the ergonomics program, it is clearly unreasonable to expect that a successful program will somehow emerge. Likewise, if responsibilities are assigned but no authority is granted and no resources are provided, an ergonomics program is destined to fail. For example, if an individual is assigned responsibility for training workers in a problem job, that person needs access to relevant information about the MSD hazards and controls in the job, sufficient time to administer the training, and a suitable location for the training to take place. Communicating periodically with employees about the program and their concerns about MSDs is similarly essential to creating an environment where both the employer and employees are fully aware of issues relating to the ergonomics program. If a regular, two-way exchange does not take place, it would be impossible for employees to keep abreast of changes in the ergonomics program, or for the employer to receive feedback regarding the program. Without full knowledge, the benefits of the program will be diminished. The endorsement of management leadership in comments and the incorporation of this element in successful ergonomics programs supports OSHA's conviction that management leadership is a critical component of an ergonomics program.

Those who expressed the sentiment that the management leadership requirements of the proposal were vague or burdensome appeared to believe that OSHA compliance personnel would arbitrarily decide if the authority, resources, and information provided were satisfactory, or if the frequency of communication was adequate. OSHA reaffirms its belief, expressed in the proposal, that employers should retain broad discretion in deciding who should bear responsibility for the various components of the ergonomics program, and what authority, resources, and information are necessary and appropriate to meet the assigned responsibilities in a given workplace.

The frequency of communication with employees is also subject to wide latitude in order to account for the needs of different workplaces. The term ''periodically'' is used in the standard to indicate that communication must be performed on a regular basis that is appropriate for the conditions in the workplace. A rigid schedule, however, is not specified, in order to provide flexibility to account for the circumstances found in different workplaces and even at different times in the same workplace. Additional discussion of this topic can be found in the section of this preamble devoted to additional statutory issues (see Section XII of the preamble).

The general requirements in paragraph (h) of the final rule for the assignment of responsibilities and provision of authority, resources and information are designed to complement the more specific requirements for action found elsewhere in the standard. For instance, under paragraph (i) of this final rule, employees must receive prompt responses to reports of MSDs. It is the duty of the employer to assign the responsibility for providing those responses and to provide the necessary authority, resources, and information needed to do so. If a prompt, correct response is given to the employee, then the employer's assignment of responsibility and provision of authority, resources, and information will clearly have been satisfactory.

The final rule does not describe how responsibility is to be allocated or how individuals will be held accountable for their responsibilities. This is to allow employers the greatest possible flexibility in adapting the program to their particular situation. A concern was registered that the proposed requirement for assigning responsibility would conflict with a management structure that did not include supervisors (see, *e.g.*, Ex. 30–3765). OSHA does not intend to prescribe what program responsibilities are vested in any party. An employer may choose to designate and empower front line employees with any responsibility associated with the program, so long as the authority, resources, and information necessary to meet those responsibilities are provided.

The role that contractors, consultants, and other outside parties may play in an ergonomics program has also been recognized by the Agency. Although not required by the standard, OSHA is aware that outside expertise may be beneficial in some instances. Accordingly, the final rule allows the employer to chose who is designated with regard to the assignment of responsibility. Ergonomists, safety professionals, industrial hygienists, and others may be involved in the employer's program.

Several commenters suggested that OSHA place requirements on employees as well as employers in the final rule (see, *e.g.*, Exs. 30–3765, 30–584, 30–3368). These commenters believe that employees must take responsibility for their actions. OSHA agrees that active employee involvement in the ergonomics program is essential to program effectiveness but does not believe that this principle should be stated in the standard, for a number of reasons. First, the OSH Act itself, at Section 5(b), states that ''Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to the OSH Act which are applicable to his own actions and conduct.'' However, the courts have repeatedly held that employers are responsible under Section 5(a)(2) of the Act for ensuring worker protection. For example, the court in *Brock* v. *City Oil Well Service Co.,* 795 F. 2d 507, 511 (5th Cir. 1986) held, ''it is the employer's responsibility to ensure that the

employees are protected. It may accomplish this objective through others if it chooses, but the duty to provide the protection remains the employer's.'' If, for example, an employer has determined that lifting an 80-pound box poses an MSD hazard to employees, the employer can establish a policy of requiring employees to use a mechanical lift to raise such a box and train employees how to do this. The employer could then hold the employee accountable for adhering to this policy in the same manner as other policies or rules are enforced.

In addition to providing authority, resources, and information, the proposed management leadership section included a requirement to provide the training necessary to meet assigned responsibilities. Because training for those responsible for setting up and managing the program is addressed in paragraph (t) of this final rule, training has been deleted from this paragraph in order to avoid potential confusion.

Some commenters expressed the belief that management leadership is implicit in an effective ergonomics program, and an independent requirement for management leadership is therefore unwarranted (see, *e.g.*, Exs. 30–3765, 30–1293). Dow Chemical, for example, while strongly supporting the need for management leadership in safety and health activities, expressed the view that it is not appropriate for OSHA to attempt to regulate and enforce leadership. By establishing and evaluating the effectiveness of an ergonomics program, Dow argued, the employer has in effect demonstrated leadership (Ex. 30–3765).

In a similar vein, some parties argued that the requirements for management leadership were largely redundant with other sections of the proposal. They pointed out, for example, that communicating periodically with employees about the ergonomics program and their concerns about MSDs was part of the proposed management leadership provision, while separate, specific requirements for communication with employees were proposed as part of the provisions pertaining to quick fix, employee participation, hazard information and reporting, job hazard analysis and control, training, MSD management, and program evaluation. This ''duplication,'' it was argued, could subject employers to being cited twice for a single violation (see, *e.g.*, Exs. 30–3344, 30–4674).

OSHA believes that there is little, if any, overlap with other parts of this standard. The management leadership and employee participation elements of the final rule should be considered the overall conceptual foundation of an effective ergonomics program and a vital part of the organizational framework of an effective program. By fully understanding the importance of management leadership and employee participation, it is expected that program managers will determine how best to apply these concepts in a particular workplace and how the individual subelements will work most efficiently in their environment. Even where some overlap could be perceived, it is not OSHA's policy to issue duplicate citations for a single violation.

The management leadership element also includes requirements unique to this paragraph, such as the requirement in paragraph (h)(3). That requirement specifies that the employer must ensure that their policies and practices encourage and do not discourage reporting or participation in the program. OSHA believes that applying this provision in an ergonomics program is a logical component of management's effort to direct the ergonomics program in a manner that will be protective of employee health.

OSHA's proposed requirement for employers to ensure that their existing policies and practices encourage and do not discourage reporting and participation in the ergonomics program elicited a substantial volume of comment. As explained in the preamble of the proposal, this proposed provision was intended to encourage the early reporting of MSDs and meaningful employee participation in the ergonomics program. OSHA believes that employees in all workplaces should be encouraged by their employers to report injuries, illnesses, and hazards of all kinds—not just those related to ergonomic issues—because only full and frank reporting allows employers to identify hazards and do something about them.

Particular attention was paid by participants regarding the requirement that employers ensure that their policies and practices do not discourage reporting and participation in the program, and the effect of this provision on existing employer programs, including safety incentive programs and employee drug testing programs.

Policies and practices given in the preamble to the proposal as examples of those that may discourage reporting included:

- Programs that reward or punish employees on the basis of injury or illness reports by offering incentives or awards based on low numbers or rates of reported MSDs.
- Policies that require every employee reporting an MSD or MSD signs and symptoms to submit to a drug or alcohol test.
- Direct or reasonably perceived threats of retaliation, including firing or suspension, withholding overtime work for anyone who reports MSD signs or symptoms, (even from jobs that do not involve exposure to risk factors), prohibiting the use of sick leave for a work-related injury; and sending every employee who reports MSD signs and symptoms home without pay.

Expressed or implied warnings of retaliation for reporting MSDs, MSD signs and symptoms, or MSD hazards would clearly be considered a practice that would discourage reporting. If, for example, a supervisor were to inform employees working the day shift that reporting MSD signs and symptoms would automatically result in transfer to the night shift, this action could be reasonably anticipated to suppress reporting. An example of a situation similar to this was described by the UFCW. The union explained that employees were reluctant to report injuries in this situation due to the consequences they would face:

> [The company] had established a special ''C'' shift—the graveyard shift—for employees suffering from work-related injuries, many of which were cumulative trauma disorders. The purported purpose of the C shift crew was to assist injured workers with long term medical restrictions in returning to regular duty. In fact, however, a number of employees assigned to the crew were taken off regular duty jobs which they had been performing successfully with their restrictions. They were then isolated and segregated on the C shift and assigned degrading, demeaning, make-work tasks such as picking up cigarette butts in the parking lot at night with flashlights or scraping rust off of pipes in the rendering department (Ex. 32–210–2).

Some employers have taken this a step further, pursuing policies that discipline workers for reporting injuries, without considering the cause of those injuries. When rewards or punishment are linked to the reporting of MSDs or MSD signs and symptoms, employee reporting behavior can clearly be influenced. Punishment for reporting in the form of wage reductions, loss of overtime, reprimands, suspensions, or other means can be expected to discourage reporting.

An example of this approach is a system of imposing progressively more severe penalties when injuries are reported, such as a written reprimand for the first incident, followed by suspension, and finally termination (see, *e.g.*, Exs. 32–298–2). Another example is a system that assigns a point

value to an incident based on factors such as the cost of the incident to the employer or whether lost workdays were involved. Progressive levels of punishment are meted out based upon the number of points that an employee accumulates (see, *e.g.*, Ex. 500–111–1). Kathy Saumier of the United Steelworkers described such a program and its results in the plastics plant where she worked:

> The company had a policy to give out points if an employee missed work even due to work related injury. After an employee accumulated seven points, the company reduced the employees' pay by 50 cents per hour. If the employee accumulated 15 points an employee was then terminated. This system caused many workers to go to work injured for fear of pay reduction or termination (Tr. 10992).

The record also included many instances where, intentionally or inadvertently, employer policies and practices were said to discourage employees from reporting MSDs (see, *e.g.*, Exs. 20–626, 32–111–4, 32–198–4–1, 32–198–4–2, 32–210–2, 32–298–2, Tr. 5598, Tr. 6980, Tr. 7715, Tr. 7729, Tr. 7387, Tr. 7730, Tr. 8041, Tr. 10153, Tr. 10230, Tr. 10763, Tr. 13870, Tr. 14535, Tr. 15131, Tr. 15453, Tr. 16766).

Incentive programs that offer rewards to employees or groups of employees based on a low number of reported injuries were also mentioned as factors inhibiting the reporting of MSDs. Bill Byington of the IBT described how employees in his workplace were being taken to a baseball game for completing a month of work without a reported injury; he was aware, however, that at least one of the members of the group had sustained an injury and not reported it (Tr. 15453). Sandy Brooks of the United Steelworkers related her experience with a ''safety bingo'' program, where employees receive a bingo number each day, and the employee who wins the bingo game receives cash, weekend trips, and dinners as prizes. The bingo game ends for all employees, however, when an OSHA recordable injury is reported. Ms. Brooks was also aware of workers who did not report injuries because of the incentive program (Tr. 7703).

An additional factor in group incentive programs that can serve to coerce employees to refrain from reporting MSDs is the peer pressure that can be exerted when group awards are at stake. Joe Enos of the UAW described the result of an incentive program that offered a microwave oven to a team of workers if they reduced reported injuries 25% from the previous year:

> The group had achieved that goal going into November and they still had a month to go. And one of the workers got hurt. And the rest of his coworkers told him, ''Hey, you go to medical, there goes the microwave.'' And this guy realized that his health was more important than some microwave. But a good many of his coworkers wouldn't even talk to him for a couple of weeks as a result of that (Tr. 15453).

Dr. Richard Bunch of the Industrial Safety and Rehabilitation Institute told of an injury sustained but not reported early, in order to preserve workers' chances of winning a barbeque pit:

> One company was giving a barbeque pit as a prize if you went so many months without reporting an injury. And one gentleman had a back problem and did not report it because the other six members on his team threatened him with violence. So in that case, he did not report it, but ended up going to a full blown frank rupture of the disc (Tr. 11638).

These accounts of individuals support the impression that incentive programs that tie rewards or punishment to the report of an injury may result in reductions in reported injuries and illnesses, at least in part due to lack of reporting rather than an actual reduction in the number of injuries that occur. Nancy Lessin of the Massachusetts AFL–CIO espoused this view:

> Workers can not control the conditions which lead to most work-related injuries and illnesses. They can control whether or not they report an injury or illness. Safety incentive programs manipulate the thing workers can control—the reporting of workplace injuries and illnesses * * * (Ex. 32–298–2).

The United Steelworkers concurred with that assessment:

> We know better than to believe that worker behavior is the primary cause of most workplace accidents. We know that exposure to workplace hazards causes injuries and illness and exposure to ergonomic hazards causes MSDs. Ergonomic hazards need to be controlled to eliminate MSDs in the same manner that we address any workplace hazard. Incentive programs based on injury rates, and behavior-based safety programs do not correct hazards. In fact, these programs can make a bad situation worse by diverting attention from correctable hazards, and promoting the under reporting of injuries (Ex. 32–111–4).

Several commenters argued that OSHA had not made a determination that incentive programs result in the underreporting of MSDs (see, *e.g.*, Exs. 30–4185, 30–1070, 30–3347, 30–4185). The Synthetic Organic Chemical Manufacturers Association suggested that OSHA obtain data to support its position, stating:

> If OSHA believes that employers are not properly reporting injuries and illnesses, it should address this issue by gathering the data to substantiate its position. OSHA should not discourage employers from utilizing all necessary injury/illness prevention tools. There is no basis for the proposed Ergonomics Standard to suggest that these effective programs should be subject to further scrutiny (Ex. 30–3843).

Sufficient evidence has already been entered in the record, however, for OSHA to reach the conclusion that MSDs are substantially underreported (see the discussion of underreporting in the Significance of Risk section of this preamble as well as the Benefits chapter of the Final Economic Analysis). Evidence also supports the belief that employer policies and practices often contribute to this underreporting by discouraging the reporting of MSDs.

A review of the literature on safety incentives commissioned by OSHA and published in 1998 divided incentive programs into two categories based on the behavior they reward. The review found that the literature strongly indicates that programs that measure safe work practices, such as wearing safety glasses for eye protection or using a seat belt when driving, may increase the frequency of such practices. The literature review further disclosed that incentive programs that focus on reductions in the number of injuries and illnesses reported do not improve safety practices. No scientific studies were found indicating that such programs had either a positive or a negative impact (Ex. 502–281).

Some policies and practices can affect employee participation in the ergonomics program, as well as employees' incentive to report. Employees who are punished or discouraged from reporting MSDs or MSD signs and symptoms, may also feel discouraged from participating in any meetings or discussions about ergonomic problems in the workplace and how to address them. If a worker is threatened with retaliation for pointing out hazards or for participating in a job hazard analysis, that worker and his or her co-workers are unlikely to take part in this activity or future activities. Employees are likely to be discouraged from requesting information to which they may be entitled, such as training materials or information about this standard, if they fear retaliation or if obtaining the information is made inconvenient. Likewise, if employees in a problem job are asked for recommendations about eliminating or controlling MSD hazards, but are required to attend a meeting at an unreasonable time in an inconvenient place, or that may involve loss of pay in order to submit those recommendations, the likelihood of those employees

participating in the process would be diminished.

Some commenters were concerned that a wide variety of employer policies and practices could have the potential to impact employee participation and reporting of injuries; even a review of a manager's or supervisor's performance could be found to constitute a violation of the standard when performance criteria in that review include the number of injuries and illnesses recorded by employees under his or her supervision (Ex. 30–4185).

OSHA is concerned with the effect of a policy on employees' participation in the ergonomics program and whether the program or policy discourages reporting. In some cases, making the number of injuries and illnesses recorded a part of a manager's performance review can result in a policy the discourages reporting. Larry Hall of the United Food and Commercial Workers described such a situation.

> One of the things that happens with the [manager] bonuses is the worker reports a problem, and the manager immediately tells them how that is going to affect their bonus. If you are working for me and I say, ''Gee, that is going to really affect my bonus. So, for the rest of your life, you get to work nights,'' these people write their schedules. They control their lives. If you are going to displease me and take money out of my pocket, I can really do a lot to you and stay within the union contract. (Tr 14538)

OSHA finds that the evidence strongly demonstrates that employer policies and practices that reward non-reporting and punish, threaten, or otherwise discourage employee reporting of MSD incidents have the effect, in many instances, of suppressing incident reports. This conclusion is based on the strong record presented by witnesses and documentary submissions as well as on the logic that providing incentives to not report accidents or illnesses is likely to reduce the number of such reports, but unless the cause of those incidents is addressed, it is unreasonable to believe that MSD incidents themselves will be reduced in number. The litany of case reports in the record where employer policies and practices were said to deter reporting reinforce this position. The concealment of MSD incidents would in fact have an effect directly opposed to the purpose of this standard. Hazards that would otherwise be identified and eliminated or controlled would remain and continue to threaten employees. MSD incidents that, if reported, could be limited in severity through rest or treatment would instead be allowed to progress.

In contrast to the comments describing the pressures on employees not to report MSDs, a number of parties were concerned that the proposed prohibition on policies or practices could inadvertently eliminate widely accepted, sensible, and successful safety practices. Many commenters indicated concern that the proposed prohibition on policies or practices that discourage worker reporting could be interpreted to eliminate demonstrably successful employee incentive programs (see, *e.g.*, Exs. 30–3765, 32–368–1, 30–656, 30–1048, 30–1070, 30–1349, 30–1551, 30–1567, 30–1616, 30–1652, 30–1671, 30–1901, 30–2038, 30–2050, 30–2061, 30–2499, 30–2514, 30–2799, 30–2811, 30–2812, 30–2814, 30–2815, 30–2846, 30–2988, 30–2990, 30–3086, 30–3174, 30–3177, 30–3336, 30–3349, 30–3353, 30–3354, 30–3678, 30–3721, 30–3736, 30–3745, 30–3819, 30–3848, 30–3951, 30–4122, 30–4185, 30–4334, 30–4496, 30–4540, 30–4607, 30–4674, 30–4702, 30–4818, 30–4822, 30–4839, 30–4843, 31–310, 32–21–1, 32–82–1, 32–120–1, Tr. 10445, Tr. 11502, Tr. 12857, Tr. 16924, Tr. 17461, Tr. 17483, 30–4340, 500–1–28, 500–1–29, 500–1–42, 500–1–69, 500–1–70, 500–1–79, 500–1–86, 500–1–95, 500–1–106, 500–1–112, 500–1–113, 500–1–114, 500–1–136, 500–1–147, 500–1–181, 500–1–117, 500–1–119, 500–1–121, 500–1–124, 500–1–125, 500–1–127, 500–1–135, 500–1–137, 500–1–152, 500–1–193, 500–1–442, 32–258–2, 30–911, 30–1942, 30–3236, 30–3339, 500–219, 601–x–1710, 601–x–1711, 30–4527, 30–980, 30–2668, 30–4565, 30–3847, 30–2684, L30–4985, 30–4029, 30–4335, 30–4443, 30–1004, 30–1010, 30–1017, 30–1025, 30–1027, 30–1035, 30–1038, 30–1042, 30–1044, 30–1045, 30–1079, 30–1080, 30–1089, 30–1099, 30–1163, 30–1164, 30–1401, 30–1403, 30–1423, 30–1424, 30–1436, 30–1440, 30–1455, 30–1460, 30–1463, 30–1495, 30–1497, 30–1566, 30–1658, 30–1659, 30–1674, 30–1675, 30–1682, 30–1684, 30–1685, 30–1686, 30–1687, 30–1688, 30–1689, 30–1690, 30–1691, 30–1916, 30–2124, 30–2126, 30–2234, 30–2235, 30–2236, 30–2237, 30–2275, 30–2279, 30–2311, 30–2369, 30–2376, 30–2588, 30–2673, 30–2674, 30–2768, 30–2850, 30–2925, 30–3002, 30–3042, 30–3044, 30–3080, 30–3083, 30–3087, 30–3229, 30–3380, 30–344, 30–346, 30–3822, 30–3985, 30–3988, 30–4037, 30–4059, 30–4507, 30–4770, 30–4841, 30–5044, 30–5106, 30–634, 30–636, 30–638, 30–643, 30–649, 30–871, 30–883, 30–891, 30–903, 30–905, 30–918, 30–978, 30–994, 30–995, 600–x–10, 600–x–11, 600–x–12, 600–x–13, 600–x–45, 600–x–46, 600–x–5, 600–x–6, 600–x–7, 600–x–9, 601–x–1358, 601–x–1363, 601–x–1364, 601–x–1365, 601–x–1366, 601–x–1367, 30–1416, 30–1453, 30–1457, 30–1616, 30–1998, 30–1999, 30–2131, 30–2142, 30–2184, 30–2233, 30–2250, 30–2304, 30–2395, 30–2396, 30–2423, 30–2431, 30–2736, 30–2829, 30–2889, 30–2891, 30–2992, 30–3003, 30–3254, 30–3334, 30–3393, 30–3551, 30–3597, 30–3791, 30–3882, 30–3936, 30–3944, 30–3974, 30–3977, 30–3999, 30–4464, 30–4532, 30–4539, 30–4544, 30–4629, 30–4657, 30–4667, 30–4669, 30–4980, 30–5034, 30–5076, 30–5095, 30–5101, L30–4952, L30–4953, L30–5096).

Caterpillar Inc., for instance, attested to the favorable impact of incentive programs in that firm:

> Incentive programs have always been an excellent vehicle to raise awareness, communicate various issues throughout the workplace and show employer concern about employee safety. While OSHA considers these programs to be disincentives [to the reporting of MSDs and MSD signs and symptoms], our experience shows that they have positive benefits. By increasing awareness and rewarding safe behaviors through incentive programs, employers have seen a reduction in all injury categories (Ex. 30–4607).

Nothing in this final rule would prohibit incentive or award programs. The obligation that an employer would have, should they chose to adopt an incentive program, would be to ensure that the incentive program did not discourage the reporting of MSDs, MSD signs and symptoms, or MSD hazards, or discourage participation in the ergonomics program. As explained previously, OSHA's concern is that discouraging full reporting and participation in the ergonomics program will diminish the effectiveness of the program.

Although incentive programs that are successful in promoting workplace safety can be expected to result in a reduction in the number of injuries reported, an unsuccessful program that does not improve workplace safety can also result in fewer reported injuries. When the yardstick for measuring the success of the program is only the number of injuries reported, the program can distort the true state of affairs and preclude early intervention by inducing employees to avoid reporting their injuries. This problem is particularly critical with regard to MSD signs and symptoms, where early intervention can be of great importance. OSHA encourages employers to focus any incentives on safe work practices, active participation in safety programs, and identification of hazards in the workplace. By doing so, the root causes of injuries and illnesses can be addressed, and a safer workplace can be

created. The Incentive Federation described the types of activities that a safety incentive program can target, rather than using the number or rate of reported injuries as its objective:

* * * a good safety incentive program often focuses on proactive behavior. For example, it might encourage employees to make safety suggestions, attend safety meetings, promote safety awareness, participate in safety inspections, report safe behavior, report near misses, and so forth. In addition, self-directed safety teams, where employees observe each other at work and report good and bad safety conduct (without necessarily using the names of the specific employees), encourage safe behavior. Encouraging this type of employee participation is extremely useful, because employees are reasonably objective in observing their peers, and they report good and bad behavior. The conduct observed can then be included in periodic reports or reviewed in safety meetings to stress safe behavior. (Ex. 30–1100).

Drug testing programs, when applied to all workers who report MSDs, were also said to hinder full reporting of injuries. Chuck Monohan of the International Brotherhood of Electrical Workers explained that a fear of false positive results was responsible for non-reporting (Tr. 7378). Other commenters also discussed the chilling effect that drug testing programs can have on reporting injuries (Tr. 5997, Tr. 13869, Tr. 17509)

A large number of commenters expressed concern that the proposed prohibition on policies or practices that discourage worker reporting could be interpreted to eliminate widely accepted drug testing policies (see, *e.g.,* Exs. 30–536, 30–2208, 32–368–1, 30–3765, 30–419, 30–519, 30–1012, 30–1048, 30–1070, 30–1261, 30–1332, 30–1348, 30–1349, 30–1358, 30–1536, 30–1551, 30–1567, 30–1616, 30–1652, 30–1671, 30–1901, 30–2050, 30–2061, 30–2499, 30–2514, 30–2645, 30–2675, 30–2799, 30–2811, 30–2812, 30–2814, 30–2815, 30–2988, 30–2990, 30–3174, 30–3177, 30–3348, 30–3349, 30–3353, 30–3356, 30–3359, 30–3721, 30–3723, 30–3736, 30–3745, 30–3819, 30–3951, 30–4046, 30–4122, 30–4567, 30–4607, 30–4628, 30–4674, 30–4702, 30–4713, 30–4818, 30–4822, 30–4839, 30–4844, 31–282, 31–298, 31–310, 32–335, Tr. 4335, Tr. 4909, Tr. 6112, Tr. 8350, Tr. 9190, Tr. 10444, Tr. 12857, Tr. 12958, Tr. 15621, Tr. 15644, Tr. 15976, Tr. 17461, Tr. 17483, 30–3725, 30–4340, 30–4146, 500–1–28, 500–1–42, 500–1–69, 500–1–70, 500–1–79, 500–1–86, 500–1–95, 500–1–106, 500–1–112, 500–1–113, 500–1–114, 500–1–136, 500–1–140, 500–1–147, 500–1–181, 500–1–185, 500–1–117, 500–1–119, 500–1–121, 500–1–124, 500–1–125, 500–1–127, 500–1–135, 500–1–137, 500–1–152, 500–1–193, 500–1–411, 500–1–384, 500–1–385, 500–1–386, 500–1–413, 500–1–423, 500–1–442, 500–16, 500–52, 500–23–1, 32–258–2, 30–904, 30–911, 30–1942, 30–3236, 30–3339, 500–219, 30–4550, 601–x–1711, 30–1363, 30–4248, 30–4778, 30–2455, 30–4527, 30–2668, 30–4565, 30–3847, 30–2684, L30–4985, 30–3472, 30–3582, 30–4029, 30–4335, 30–4443, 30–4475, 30–4528, 30–4688, 30–1004, 30–1010, 30–1017, 30–1025, 30–1027, 30–1035, 30–1038, 30–1042, 30–1044, 30–1045, 30–1079, 30–1080, 30–1089, 30–1099, 30–1163, 30–1164, 30–1401, 30–1403, 30–1423, 30–1424, 30–1436, 30–1440, 30–1455, 30–1460, 30–1463, 30–1495, 30–1497, 30–1566, 30–1658, 30–1659, 30–1674, 30–1675, 30–1682, 30–1684, 30–1685, 30–1686, 30–1687, 30–1688, 30–1689, 30–1690, 30–1691, 30–1916, 30–2124, 30–2126, 30–2234, 30–2235, 30–2236, 30–2237, 30–2275, 30–2279, 30–2311, 30–2369, 30–2376, 30–2588, 30–2673, 30–2674, 30–2768, 30–2850, 30–2925, 30–3002, 30–3042, 30–3044, 30–3080, 30–3083, 30–3087, 30–3229, 30–3380, 30–344, 30–346, 30–3822, 30–3985, 30–3988, 30–4037, 30–4059, 30–4507, 30–4770, 30–4841, 30–5044, 30–5106, 30–634, 30–636, 30–638, 30–643, 30–649, 30–871, 30–883, 30–891, 30–903, 30–905, 30–918, 30–978, 30–994, 30–995, 600–x–10, 600–x–11, 600–x–12, 600–x–13, 600–x–45, 600–x–46, 600–x–5, 600–x–6, 600–x–7, 600–x–9, 601–x–1358, 601–x–1363, 601–x–1364, 601–x–1365, 601–x–1366, 601–x–1367, 30–2410, 30–2289, 30–3877, 30–2601, 30–3160, 30–3598, 30–2912, 30–1332, L30–5025, 30–4280, 30–1416, 30–1453, 30–1457, 30–1616, 30–1998, 30–1999, 30–2131, 30–2142, 30–2184, 30–2233, 30–2250, 30–2304, 30–2395, 30–2396, 30–2423, 30–2431, 30–2736, 30–2829, 30–2889, 30–2891, 30–2992, 30–3003, 30–3254, 30–3334, 30–3393, 30–3551, 30–3597, 30–3791, 30–3882, 30–3936, 30–3944, 30–3974, 30–3977, 30–3999, 30–4464, 30–4532, 30–4539, 30–4544, 30–4629, 30–4657, 30–4667, 30–4669, 30–4980, 30–5034, 30–5076, 30–5095, 30–5101, L30–4952, L30–4953, L30–5096).

The sentiment that the contribution of drug-testing programs to workplace safety should not be compromised by the requirements of the ergonomics standard was expressed by Food Distributors International:

In the view of FDI and its members, the possibility that some individuals will feel constrained to avoid reporting workplace injuries or accidents because of a drug test requirement that might be triggered is not an overriding concern. These fears largely will relate only to those whose drug use may be discovered, and their protection should not be the goal of a major OSHA regulatory scheme. In addition, any such inhibiting effect is more than outweighed by the workplace accidents and injuries that are avoided through maintenance of an effective drug-free workplace program (Ex. 30–3819)

OSHA is not aware of any basis for concluding that the development of MSDs is in any way associated with the use of drugs or alcohol. The reporting of MSDs or MSD signs and symptoms covered under this rule, therefore, cannot be considered by itself to provide any justification for testing. Although subjecting all parties reporting injuries or all OSHA recordable cases to testing has sometimes been used by employers as a matter of administrative convenience in identifying individuals for testing, the lack of a relationship between drug or alcohol use and the MSDs covered by this rule, along with the detrimental effect on reporting behavior that testing can have, combine to make this an inappropriate practice where MSDs are concerned.

Furthermore, there is no evidence that drug tests discourage workers from reporting injuries only if they fear that drug use will be discovered. Adrienne Markowitz of the UFCW described a poultry processing plant where workers who reported pain in the hands and wrists were required to be tested for illegal drugs:

This is a church going and religious community. Most people were not worried that drugs would be found because they didn't take them. But they weren't happy with having to suffer the indignities of having someone watch them urinate, were afraid that inaccurate testing and laboratory practices [would erroneously indicate illegal drug use], were concerned that the medications they took would show up as illegal drugs, and [were] fearful that the company supervisors would doctor the records. Many, for the reasons I have just stated, refused to take the test and were fired. And many others just never reported their illnesses (Tr. 5998).

This rule does not in any way prevent an employer from conducting testing if it is required by law, is based on reasonable suspicion, is part of the job application process, is part of routine fitness-for duty examination, is done as follow-up after entering an employee assistance or drug rehabilitation program, or is administered to assist in post-accident investigation. A blanket policy that requires all employees reporting MSDs or signs and symptoms of MSDs to submit to drug or alcohol testing, however, would hinder the effectiveness of the ergonomics program if such a policy results in underreporting.

Nor is the fear that a back injury or other MSD may be the result of an accident caused by drug or alcohol use

a reason for testing employees for drugs when reporting an MSD or MSD signs or symptoms. As stated in paragraph (a), this standard does not address injuries caused by slips, trips, falls, vehicle accidents, or other similar accidents. The standard addresses injuries that are the result of exposure to force, repetition, awkward postures, vibration, and contact stress. Injuries covered by the standard are commonly associated with prolonged or excessive exposures to these ergonomic risk factors. There is no reason to believe that drugs or alcohol have any relevance to the development of these conditions and certainly no evidence that impairment at the time of reporting has any relevance. Simply reporting MSD signs and symptoms therefore cannot be viewed as a legitimate reason to suspect drug or alcohol abuse.

Some commenters argued that if an ergonomics standard did restrict drug testing programs, this could conflict with regulatory requirements of the Department of Transportation or Nuclear Regulatory Commission, or with policies established through collective bargaining (see, *e.g.,* Exs. 30–3853, 30–3765, 30–1070, 30–1332, 30–1671, 30–3284, 30–3359, 32–335, Tr. 15621, 500–1–28, 30–4527, 30–4029, 30–4475, 30–4248). Restrictions on drug testing were also said to conflict with requirements for companies with government contracts (see, *e.g.,* Exs. 601–x–1711, 30–4475).

Language in the proposal that could affect certain employer drug testing policies was said to conflict with state workers' compensation laws, and thus violate Section 4(b)(4) of the Occupational Safety and Health Act. State workers' compensation laws, it was said, may require drug testing in certain instances, allow reduced insurance premiums for those employers with testing programs, or allow impairment to be used as a defense in contesting compensation claims (see, *e.g.,* Exs. 500–104, 500–104–1).

It was argued that restrictions on drug testing programs could result in liability claims against those employers whose employees acted in an unsafe manner due to impairment. The New Mexico Self Insurers Fund stated:

> OSHA may have had the best intentions when writing the preamble, however if state and local government municipal employers were to neglect the possibility that alcohol and drug use was a factor in an injury, whether or not it is an MSD, municipal liability would rise exponentially. The bottom line is that many local governments would not be immune from lawsuits where gross negligence is alleged. It would be easy to show negligence on the part of a local government that allowed ''waivers'' of its alcohol and drug testing ordinances for employees in order to permit full and free reporting of MSDs (Ex. 30–4810).

OSHA's concern is that testing not be conducted in a manner that penalizes individuals reporting MSDs or participating in ergonomics programs. This final rule does not restrict employers' drug or alcohol testing policies where such policies are authorized by state or federal law. It should be noted, however, that DOT regulations, which require post accident testing and testing of safety sensitive employees and under certain other circumstances, do not require drug testing when MSDs or any other type of injury or illness is reported.

Workers compensation and other state and federal laws that require drug testing following a traffic or other accident, are also not generally relevant to the application of this standard, because as explained above, MSDs resulting from accidents, slips, trips and falls are specifically exempted from this rule.

A number of employee representatives expressed the opinion that policies or practices that can discourage worker participation in the ergonomics program, such as incentive programs and post-injury drug testing, should be explicitly prohibited in the rule (see, *e.g.,* Exs. 32–339–1, 32–111–4, 32–198–4, 32–210–2, 500–50). Absent such a prohibition, it was argued, an ergonomics standard triggered by employee reports of injury would be undermined by employers who would pressure employees to avoid reporting injuries. These commenters argued that the case-by-case determination approach described in the preamble to the proposal would be inadequate to deter practices that discourage participation and reporting, and a blanket prohibition in the rule itself is necessary.

Some parties indicated that they did not find the proposal sufficiently clear in indicating what policies or practices would be considered by OSHA to discourage worker participation in the ergonomics program (see, *e.g.,* Exs. 30–3853, 30–4185, 32–337–1, 30–653, 30–1350, 30–2216, 30–3233, 30–3344, 32–82–1, 30–1101, 500–33). Concern was expressed that compliance would be dependent upon whether or not employees feel discouraged, and would thus be determined by the subjective perceptions of employees (see, *e.g.,* Ex. 30–3853, 30–4247, 500–33, 32–266–1). TXU Business Services, for example, stated:

> Any regulation that has provisions for employees ''not feeling discouraged'' would be impossible to enforce fairly. For example, identical employer conduct could be legal in one plant, or part of a plant, and illegal in another and the employer might never know it (Ex. 500–1–28).

In order to provide an objective basis for enforcement of this provision, OSHA has concluded that a pattern of underreporting must be evident in the workplace before a determination will be made that any given employer policy or practice discourages reporting of MSDs or signs and symptoms of MSDs. If underreporting or discouragement of employee participation in the ergonomics program is found at a particular establishment as a result of a records review or employee interviews, OSHA will evaluate the situation to determine if employer policies and practices have had the effect of discouraging reporting or participation in the ergonomics program. OSHA's position is that these policies and procedures are not per se illegal, but they can clearly discourage reporting and participation. If an employer has policies or procedures with this potential, the employer must ensure that these policies and procedures are not actually discouraging reporting or participation.

OSHA expects that employers will have ample opportunity to discover whether employees are being discouraged through the periodic communication that will take place under the standard. If policies and practices are determined to discourage reporting or participation, employers would need to take action to remedy this situation.

OSHA considers it important that the employer not only not discourage, but actively encourage reporting and participation in the ergonomics program. The Agency believes that this goal can be accomplished by providing information to employees about the importance of early reporting in accordance with paragraph (d), along with effective training on reporting and the ergonomics program in accordance with paragraph (t) of this final rule.

Several parties asked whether the proposed prohibition on policies or practices that discourage reporting would apply to an employer's decision as to whether or not an employee can work overtime (see, *e.g.,* Exs. 32–368–1, 30–2208, 30–3765, 30–1671, 30–2050, 30–2499, 30–3344, 30–3348, 30–3356, 30–4628, 30–4674, 500–1–140). Withholding overtime, it was argued, may be based on a desire to prevent aggravation of the potential MSD, and limiting the employer's ability to restrict

overtime would thus conflict with provisions in the proposed standard that allow employers to use administrative controls (Ex. 30–1671). The Association of Independent Corrugated Converters stated:

> While some employers do not choose to impose such restrictions, it seems unfathomable that involuntary restrictions on some overtime work would be deemed an inappropriate management step, both before and after symptoms reported by employees are analyzed by a health care provider. The essence of some MSDs, at least in OSHA's own construct of such conditions, is that overuse in the form of ''excessive'' repeated exposure is the source of problems in many circumstances. It seems oddly inconsistent that on the one hand, the overall thrust of the ''incremental abatement'' and job re-design obligation of OSHA's full ergonomics program will focus on avoiding or reducing exposures, while on the other, an employer's judgement to limit additional exposure is retaliatory or aimed at discouraging reporting (Ex. 500–1–140).

As with incentive programs and drug and alcohol testing policies, OSHA's concern about withholding overtime is based on the discriminatory application of this practice to discourage reporting or participation in the ergonomics program. The Agency realizes that work restrictions, including limitations on the number of hours worked, are often necessary to prevent an injured employee's condition from worsening and to allow damaged tissues to recover. The provision of work restrictions, however, must be viewed separately from the reporting of MSDs and MSD signs and symptoms.

If overtime is withheld as a matter of policy simply because a report of an MSD has been made, this could have the effect of discouraging reporting. An example of such a situation would be an employee who uses a keyboard in a steady manner for eight hours per day, then works an additional two hours as a receptionist and does not perform any work involving typing or hand activity during that two hours. If this employee were to report the signs and symptoms of an MSD of the wrist, and as a matter of policy was denied the opportunity to work overtime as a receptionist but continued working eight hours at a keyboard, the effect would be to discourage reporting and would be evaluated by OSHA as described above.

OSHA does not include production incentives in the category of policies and practices that may discourage reporting or participation in the program. Mosely and Associates registered concern as to how such systems would be viewed, and expressed concern that plants may lose their competitiveness if piece rate compensation systems or production incentives are abandoned (Ex. 30–4362).

OSHA recognizes that these systems sometimes cause employees to expose themselves to MSD hazards in order to achieve higher rates of compensation. Because piece rate incentives are not directly tied to reporting or participation in the ergonomics program, however, the Agency does not view them as potential sources of discouragement to reporting and participation. With full participation in the ergonomics program, employees compensated under these systems will be provided with the protections of the ergonomics standard, including the information and training that will confer with it the ability to recognize the potential causes of MSDs and knowledge of the importance of early intervention.

Several commenters (see, *e.g.,* Exs. 30–3853, 30–4247) argued that subjecting an employer to citation for maintaining policies or practices that discourage worker participation would be contrary to the intent of Congress. These commenters argued that, by placing a discrimination provision in Section 11(c) of the OSH Act, Congress had made clear that anti-discrimination provisions should not be included in standards. These commenters therefore believe it inappropriate for OSHA to include a discrimination provision in an ergonomics standard.

Paragraph (h)(3) of the final rule is intended to prevent employers not only from discriminating against employees for reporting and participating in the ergonomics program, but also to prevent employers from having policies that discourage employees from reporting and participating, even where no discrimination has taken place. Paragraph (h)(3) thus has a different scope than section 11(c). In addition, insofar as paragraph (h)(3) addresses discrimination, it does so as part of a broader standard that is reasonably necessary and appropriate to address a serious hazard . Nothing in Section 11(c) indicates that a standard issued in accordance with Section 6(b) may not include such a provision. Provides a different enforcement mechanism than section 11(c), and nothing in section 11(c) indicates that it is the exclusive means of addressing discriminatory policies.

Paragraph (i)—Employee Participation

Paragraph (i) sets forth the final rule's provisions regarding employee participation. It requires that employers ensure that employees and their representatives, if the employees are represented by a recognized or certified collective bargaining agent, have ways to report MSDs, MSD signs and symptoms, and MSD hazards; that employees receive prompt responses to those reports when they are made; that access to the standard and to information about MSDs and the ergonomics program be provided to employees; and that employees have ways to be involved in the development, implementation, and evaluation of the ergonomics program.

The requirements of paragraph (i) closely correspond with the requirements of the proposed employee participation section. This reflects OSHA's determination, based on evidence in the record, that the involvement of employees and their representatives in an ergonomics program is critical to the effectiveness of the program. It also reflects the support for the proposed employee participation provisions expressed by commenters.

The proposed employee participation requirements were designed to cover those circumstances where the involvement of workers was essential to the success of an ergonomics program. The duty to establish a means of reporting and to provide prompt responses to reports was included because of the vital importance of an effective reporting system to the proper function of the injury-based trigger of the standard. Access to the standard and information about the ergonomics program was considered by the Agency to be necessary for employees to participate effectively in the ergonomics program. Employee input into the development, implementation, and evaluation of ergonomic programs was considered critical to program success because of the first-hand knowledge that employees could offer regarding potential solutions to MSD hazards, the appropriate content and level of training, and the effectiveness of control measures.

The proposed provisions for employee participation generated a considerable volume of comment. Support for the concept of involving employees in the ergonomics program was widespread among commenters, and few disagreed with the proposed requirements pertaining to reporting, providing responses, and furnishing access to the standard and to information. Comment on these provisions in the context of employee participation was primarily limited to requests for clarification about how the provisions would apply in practice. Substantial differences were expressed, however, concerning the level of employee involvement appropriately included in a final standard.

The importance of employee participation in the successful implementation of an ergonomics program was stressed in a number of comments (see, *e.g.,* Exs. 30–276, 30–428, 30–651, 30–3860, 30–4333, 30–4468, 32–21–1–2, 32–82–1,Tr. 3479, Tr. 6930, Tr. 3565, Tr. 5596–5597, Tr. 10202, 32–450–1–18–1, Tr. 11182, Tr. 11380, Tr. 12947, Tr. 14479, Tr. 14902, Tr. 16526, Tr. 12366, 500–29, 500–117–2, 500–177–2, 500–220, 500–215, 601-x-1587, 20–605). Mark Catlin of the Alice Hamilton Occupational Health Center, for example, stated:

> Our experience has been * * * that when there is true employee involvement from beginning to end, especially in the development of solutions, that can be a great benefit in coming up with a program that works for that specific site that is cost effective and will be maintained after it is initially set up (Tr. 5597).

The advantages that the knowledge and skills of employees have lent to successful ergonomics programs were remarked upon by a number of commentors (see, *e.g.*, Tr. 4084, Tr. 4697, Tr. 6188, Tr. 7011, Tr. 7111, Tr. 7135, Tr. 7142, Tr. 9489, Tr. 10224, Tr. 10547, Tr. 11076, Tr. 12366, Tr. 12297, Tr. 13004, Tr. 14248, Tr. 14320, 20–406, Tr. 17623). For instance, Dr. Robert McCunney of the American College of Occupational and Environmental Medicine stated:

> In my experience as a physician, I have been impressed with the knowledge that a lot of workers have about their jobs and the recommendations that can be made to improve it and reduce factors associated with illness * * * [Tr. 17633].

One aspect of employee participation included in the proposal was a means for the employee to inform the employer when MSDs or MSD signs and symptoms occur. Reporting is essential to allow the employer to become aware of those job situations where further action is necessary. For example, if an employee experiences pain and stiffness in the shoulders and believes this to be the result of workplace factors, the employer cannot be expected to make changes to the workplace to mitigate the risk factors unless the employer is aware of the existence of a problem.

Belief in the importance of employee reporting of MSDs and their signs and symptoms was expressed in a number of comments on the proposed rule (see, *e.g.*, Exs. 30–240, 30–1104, 30–2116, 30–2215, 30–2387, 30–2809, 30–3686, 30–3765, 32–77–2, 30–3813, 30–3826, 30–3849, 30–3859, 30–4185, 30–4468, 30–4538, 30–4548, 30–4562, 30–4564, 30–4837, 31–78, 31–174, 31–192, 31–227, 31–303, 31–353, 32–82–1, 32–85–3, 32–461–1, 32–111–4, 32–210–2, 32–339–1, 500–33). For example, Shipman and Goodwin LLP, on behalf of an unnamed client, stated:

> Requesting that employees report signs and symptoms encourages the success of any early intervention program (Ex. 30–2215).

Comments received on this issue are presented in greater detail in the discussion of paragraph (d), which includes a requirement that employers provide information to their employees on how to report MSDs and their signs and symptoms. The ability of employees to report MSDs and MSD signs and symptoms depends upon their understanding of the reporting mechanism, and knowledge of what constitutes a possible MSD or MSD sign or symptom.

The final rule, at paragraph (h), adds ''MSD hazards'' to the list of things employers must ensure that employees report. OSHA believes that trained employees will be able to identify MSD hazards in their workplace *before* they cause MSDs, and this will result, in turn, in steps by proactive employers to protect workers at risk even before they suffer an MSD incident. The reporting of MSD hazards has therefore been added to paragraph (i)(2) of the final rule.

The specific process employers must establish for reporting MSDs, their signs and symptoms, and MSD hazards is not prescribed in this final rule. OSHA anticipates that the process will vary from workplace to workplace, based on the size and nature of the workplace. A large facility with an on-site health care professional (HCP), for example, may choose to handle reports through the HCP. Smaller facilities may elect to have reports made directly to supervisors. The method of submitting a report is likewise not specified. Employers may chose to adopt written, electronic, or other systems for receiving reports. (Note, however, that employers are required by paragraph (v) to keep records of employee reports, primarily for evaluation purposes.)

The final rule requires the employer to ensure that employees have ways ''to promptly report'' their MSDs, signs and symptoms, and hazards. OSHA received many comments on its use of the word ''prompt'' in the proposed rule (see, *e.g.*, Exs. 30–3826, 30–3853, 30–4467, 30–3284, 30–3367, 30–4674). These commenters asked OSHA to clarify what was meant by ''prompt.'' OSHA is using the word to indicate that timely reporting is required; the effectiveness of the standard and the employer's program would clearly be compromised if employees did not report their problems quickly, at a time when preventive action can still be taken. A rigid time frame, however, is not specified in the rule, because the Agency recognizes that some flexibility is needed to account for the circumstances found in different workplaces. In general, OSHA believes that reports should be received within a few days in almost all cases, and the Agency expects employers to inform their employees about the importance of early reporting, as required by paragraph (d).

OSHA proposed that employers provide prompt responses to employee reports of MSD signs and symptoms to encourage reporting and provide feedback. OSHA's reasons for proposing that employer responses to reports be made promptly was that timely and good faith responses are essential to reinforcing the information exchange process. Several commenters asked for clarification of this proposed provision (see, *e.g.*, Exs. 30–3344, 30–3367, 30–249, 30–3749). The Society for Human Resources Management, for example, asked OSHA to specify what it would consider an adequate response. The Society questioned whether OSHA would consider acknowledgment of receipt of the report, evaluation of the report, or action to prevent the condition from worsening as responses to the report. Others asked whether the response must be in writing or whether alternative methods of communication (*e.g.*, oral) would be acceptable (see, *e.g.*, Exs. 30–3344, 30–3367, 30–3826).

If an employee experiences persistent MSD symptoms and reports that condition to the employer but receives no response, that employee is likely to consider the ergonomics program ineffective. Such a loss of confidence in the program would clearly discourage future reporting and participation. If the employer communicates the results of evaluations made based on the report, or informs the employee of any actions that are being taken as a result, the reporting employee will better understand the process and will be more likely to participate in the future. OSHA also recognizes that employers will sometimes inform the employee that a given report requires no action, *e.g.*, when an MSD hazard turns out, on closer examination, not to warrant further action. OSHA continues to believe that prompt responses to reports are an essential part of the communication that must occur between employers and employees in a functioning ergonomics program, and final paragraph (i)(2) reflects this conviction.

In order to provide flexibility to employers to tailor communication

methods to the needs of a particular workplace, the method of providing a response to employees who report is not specified. Employers may chose to adopt written, electronic, or other systems for providing responses, although a record of the response must be maintained, as required by paragraph (v).

OSHA proposed to require the employer to grant employees access to the standard and to include information about the ergonomics program. OSHA proposed this requirement to ensure that employees understood what the OSHA standard required and how the employer's program worked. The program was to include assignment of responsibilities in the ergonomics program; job hazard analysis results; hazard control plans; records of the occurrence of MSDs and reports of MSD hazards; ergonomic program evaluation results; and lists of alternative duty jobs, according to the preamble to the proposed rule [64 FR65799]. This provision recognized that information is important to full employee understanding of and participation in the ergonomics program.

OSHA was requested by commenters to define more clearly what was meant by ''access'' to the standard (Ex. 32–337–1). The Dow Chemical Company, for example (Ex. 30–3765) felt that employers should not be required to provide employees access to the standard. Dow argued that employers were required to comply with the provisions of the rule but should not be additionally burdened by providing access to the standard. In Dow's view, employees could be confused by receiving information both on the employer's ergonomics program and the standard.

The National Coalition on Ergonomics (Ex. 32–368–1) expressed concern that the employee participation provisions of the proposed standard would require employers to provide employees with access to the employer's confidential documents, which might address personnel issues, financial issues, or safety audits. If this were the case, the Coalition argued, employees with grudges or those involved in labor disputes would be able to harass their employer by disclosing or threatening to disclose proprietary information out of context or in a fashion that might have an adverse impact on the employer. The Coalition argued that this would discourage employers from performing audits with appropriate depth and thoroughness. Concern was also expressed that employee access might jeopardize medical confidentiality. (Ex. 500–1–116).

OSHA does not believe that providing employee access to the ergonomics standard is an unreasonable burden on employers, nor that providing the standard will confuse employees. Employee access to OSHA standards that affect them is a longstanding OSHA practice (see, for example, OSHA's rule's governing lead exposure, noise exposure, and so on). Access to the standard can be provided in several forms. A printed copy of the standard may be made available, or an electronic version may be provided on CD or via internet access to OSHA's web site if employees have access to a computer. OSHA believes that the standard will not be confusing to employees because they will be trained to understand the ergonomics program in their workplace and their role in it, in accordance with paragraph (t) of the final rule. OSHA does not believe that employees will flood their employees with requests to obtain and review the final standard; instead, the Agency believes that the standard is likely to be used primarily as a reference to compare the functioning of their workplace ergonomics program with the provisions of the standard to assure that the program is functioning properly and is in compliance.

Because of the importance OSHA attaches to employee access to the standard, and the relative ease of providing it, the final rule adds the term ''ready'' to the original access provision. This means that whenever an employee requests access to the standard, the employer must assure that ready access is provided, *i.e.,* that access is provided within a reasonable time and place.

Because of the importance OSHA places on employees being able to easily understand the requirements of the standard, the final rule requires employers to provide employees with a copy of the summary of the standard that is required to be made accessible in paragraph (d). Although the employer is required in paragraph (d) to make this information available to employees when they start a job, the employee should receive the summary at the time the program is implemented due to the fact that the exposures in the employees job have now been shown to exceed the levels in the Basic Screening Tool and considerable time may have passed since the employee was informed that he or she had access to this information. The summary sheet provided in Appendix B may be used for this purpose.

The Agency is also not persuaded by arguments that confidential company information or medical records would be distributed if employers provide employee access to information about the ergonomics program. The proposal specifically stated [64 FR 65799], and OSHA reiterates here, that information of a personal nature such as the medical records of other employees, is *not* included in the information to which employees are required to have access. Records of the occurrence of MSDs, for example, can be presented in a general form and do not need to include personal details. General injury and illness information is already available to employees under the provisions of 29 CFR 1904.7 with regard to the Log and Summary of recordable occupational injuries and illnesses.

OSHA also is not convinced by comments suggesting that proprietary information would be revealed if employees have access to program information. The information required to be made available, on request, is general information. For example, although an employee's detailed process and production plans might be trade secrets, the information required by this provision relates only to the control of ergonomic hazards. Technical information regarding machinery or production methods is clearly not required to be provided. Reports of MSD hazards and job hazard analysis results are not confidential and are critical information for employees if they are to participate meaningfully in the ergonomics program.

Providing employees with basic information about the common kinds of MSDs and their signs and symptoms is required by paragraph (d) of the final rule. The comments pertaining to this paragraph can be found in the summary and explanation for paragraph (d). OSHA has decided that information on MSDs and their signs and symptoms is so basic, and so important to employees, that it must be provided as part of employee participation as well. The final rule's employee participation provisions are only triggered when MSD incidents have been reported in a job that meets the action trigger. This means that the employees covered by final paragraph (i) are those who work in higher-risk jobs; these employees clearly need to be informed about MSDs and their signs and symptoms. Thus paragraph (i)(3) requires employers to inform their employees with, at a minimum, the information sheet in non-mandatory Appendix A. OSHA believes that most employers will choose to provide more detailed and specific information, such as information about the MSDs and signs and symptoms occurring among employees in jobs in their establishment.

The fourth component of the proposed employee participation section was a broad requirement that ''ways to be involved in developing, implementing and evaluating each element of the ergonomics program'' be provided to employees. This component, as explained in the preamble to the proposal, was designed to allow employers to take advantage of the knowledge, skills, and abilities that workers could contribute to the ergonomics program.

The United Steelworkers concurred with OSHA's initial assessment that employee involvement in each element of the ergonomics program was appropriate. The union stated:

> Workers and their representatives have to be involved in all aspects of the introduction and implementation of an ergonomics program in [the] workplace. After all, it is their bodies and lives that are on the line (Ex. Tr. 11047).

Vagueness was a concern of some commenters. A number of interested parties indicated that they did not understand what level of employee involvement would be required under the proposed standard (see, *e.g.,* Exs. 30–3344, 30–3848, 30–4607, 30–4674, 30–4713, Tr. 4372). These commenters stated that the proposal did not make it clear whether an employer would have unlawfully limited employee participation if, for example, employee suggestions for ergonomics improvements were rejected (see, *e.g.,* Exs. 32–78–1, 30–4467, 30–541, 30–627, 30–652, 30–1355, 30–1697, 30–1717, 30–4843, 601–x–1710). These participants argued that employers should not be required to follow the recommendations of employees or obtain their concurrence on a course of action, and should retain the authority to make all final decisions about compliance with the requirements of the standard (see, *e.g.,* Exs. 30–3934, 30–2208).

Some industry representatives stated that the level of employee involvement proposed by the requirement that employers involve employees in developing, implementing and evaluating each element of the program was excessive (see, *e.g.,* Exs. 32–368–1, 32–78–1, 30–4467, 30–240, 30–276, 30–368, 30–429, 30–434, 30–541, 30–562, 30–652, 30–1070, 30–1294, 30–1671, 30–2830, 30–2846, 30–2991, 30–3344, 30–3348, 30–3784, 30–3951, 30–4185, 30–4713, 32–21–1, 32–120–1, Tr. 11679, 500–33, 30–3744). In the view of these commenters, OSHA did not demonstrate that this level of employee involvement was necessary for an effective ergonomics program (see, *e.g.,* Exs. 32–78–1, 30–4467, 30–541, 30–627, 30–1355, 30–1545, 30–1697, 30–1717, 30–2830). Employee involvement, although commonly acknowledged as often beneficial, was not needed in every situation, and should therefore not be mandated, according to these commenters. For example, Dr. Kurt Hegmann stated:

> Hazard remediation efforts are frequently enhanced and accelerated with employee participation since the ones doing the work 40 hours a week have often thought of the most effective solution. Yet, requiring employee participation in this and other aspects of the rule is inappropriate, as these assumptions are not always true [Ex. 30–4779].

Employee involvement in supervisory training or the evaluation of management leadership, for example, were cited as program elements where employee involvement was not considered necessary (Ex. 32–78–1). In its comments on employee participation, the American College of Occupational and Environmental Medicine stated:

> * * * employee participation in the design, modification, and evaluation of all aspects of an employer's operation is unnecessary. In most facilities, manufacturing or industrial engineers effectively perform many aspects of their jobs without employee participation. OSHA's requirement for employee participation should be limited to participation on ergonomics teams and participation in the job-specific problem solving process [Ex. 30–4468].

Another commenter with a similar view argued that an employer who is able to eliminate MSD hazards without employee participation should not be required to consult employees (Ex. 30–4467).

Several practical problems about how the proposed requirements would actually work in different situations were also raised. Union Carbide Corporation indicated that such involvement would be difficult to implement when the ergonomics program is developed on a corporate level:

> Large employers such as Union Carbide develop their ergonomic programs on a corporate basis using professional staff. Of necessity, they rely on employees to assist in implementing the program, and employee evaluation of the program is always welcome. But where programs are developed on a corporate basis, it is sometimes difficult to involve employees in that development [Ex. 30–3784].

The Whirlpool Corporation believes that adhering to the requirements of the standard would hinder the company's ability to respond to ergonomic hazards when they are first identified. Safety teams that are trained to quickly identify, assess, and fix a hazard would be supplanted by the more cumbersome process required by the standard. Whirlpool believes that the standard requires the employer to obtain input from people who may have nothing to add to the process, which would increase the time and expense involved without providing any assurance that a better solution would be found (Ex. 30–4779).

Some employers interpreted the proposed requirement that employees be involved in developing the program to mean that, where a current ergonomics program already exists, the employer would be required to develop a new program (Ex. 30–3765). The Edison Electric Institute stated that it is impossible to consistently include employee involvement in all elements of the ergonomics program, and therefore recommended that the final rule allow greater flexibility to employers and only require that employees ''be provided adequate, regular opportunities to be involved in developing, implementing and evaluating appropriate elements of the program'' (Ex. 500–33).

The Northwest Food Processors Association expressed concern that engaging employees and their designated representatives in the ergonomics program could be inappropriate in some cases because the ergonomic interventions they suggested might result in the elimination of jobs or otherwise negatively impact employment opportunities. The association stated that employers should be given flexibility in the final rule to determine the appropriate approach to such situations (see, *e.g.,* Tr. 12198).

Some employers were concerned that employees could disrupt the program or decline to participate in it. These commenters believe that employee representatives may attempt to use the standard as a way to force unnecessary or costly changes for reasons unrelated to safety (see, *e.g.,* Exs. 30–2208, 30–1294, 30–3348). The Nabisco Company was concerned that requirements for employee participation could not be met if employees were unwilling to participate in the program. The company stated:

> Nabisco strongly supports the concept of employee involvement and encourages participation of employees at all levels of our organization. However, this requirement assumes that employees and their representatives will readily volunteer to participate in a management program. It has been the experience within some of our locations that union representatives do not

always encourage employee participation in management programs [Ex. 30–4201].

A common concern expressed by employers with unionized employees was that the requirements of the proposed standard for employee involvement could serve to disrupt established collective bargaining relationships (see, *e.g.,* Exs. 30–3853, 30–3765, 32–337–1, 30–323, 30–345, 30–538, 30–574, 30–1022, 30–1113, 30–1349, 30–1567, 30–1616, 30–1652, 30–2426, 30–2725, 30–2773, 30–3086, 30–3184, 30–3284, 30–3344, 30–3951, 31–332, 500–1–128, 32–266–1, 30–3841). Many companies and their unions, according to these commenters, have well-established contractual mechanisms for addressing employee safety and health issues. A typical example is a contract provision establishing a joint labor-management safety committee. According to the views of these commenters, requiring the employer to engage individual employees in the ergonomics program would stimulate resentment and conflict by forcing the employer to circumvent the union. PEPCO, for example, expressed this view:

> PEPCO, like most utility companies, has a long-established relationship with a collective-bargaining agent that represents most of our employees (International Brotherhood of Electrical Workers, AFL–CIO). PEPCO has well-established contractual mechanisms for addressing employee safety and health issues. We have joint labor-management safety committees and include our union in accident investigations. The proposal would interfere in established relationships such as these, for in several instances, it would require the employer to deal with or involve not just the employee designated representative, but also the individual unionized employee. This places the employer in the position of having to deal apart from, or even circumventing, the union in order to avoid the risk of citation [Ex. 31–332].

Consolidated Edison Company of New York urged OSHA to address this issue by indicating that the obligations for employee involvement in the final rule could be met by affording those rights to the union (Ex. 30–2816). Alan Ferranto of the National Association of Letter Carriers, however, did not believe that collective bargaining relationships would be affected by the proposed rule:

> Inevitably, when a proposal of this nature is put forth, there are those who will argue that collective bargaining will be affected. As the safety and health officer for a union which represents almost a quarter million postal employees, I'm here to say that this proposal will not affect our collective bargaining agreement with the postal service. In fact, we are satisfied that the employee involvement envisioned under OSHA's proposed ergonomic standard will complement the already agreed-upon procedures in place to address safety and health issues [Tr. 3570].

A number of labor representatives felt that the proposed requirement to involve employees and their designated representatives in developing, evaluating and implementing each element of the ergonomics program should be modified. Some parties expressed the opinion that the standard should be revised to add employee representatives to each provision where rights are granted to employees. For example, the proposed job hazard analysis provision would require the employer to ask employees whether performing the job poses physical difficulties; in the view of these commenters, this should be changed so that employees *and* their designated representatives should be consulted. The unions also suggested that the proposed control obligation section be revised to add designated representatives to the requirement to ask employees for control recommendations (see, *e.g.*, Exs. 32–339–1, 32–182–1, 32–198–4, 32–210–2, Tr. 3566).

Another commonly expressed concern of the employer community was that the proposed provision that employers provide employees ways to be involved in developing, implementing and evaluating each element of the ergonomics program would conflict with provisions of the National Labor Relations Act (NLRA) or with state laws addressing labor relations (see, *e.g.*, Exs. 30–296, 30–323, 30–328, 30–345, 30–368, 30–377, 30–397, 30–523, 30–532, 30–536, 30–380, 30–538, 30–540, 30–541, 30–562, 30–574, 30–589, 30–594, 30–598, 30–627, 30–630, 30–632, 30–648, 30–688, 30–1022, 30–1113, 30–1131, 30–1216, 30–1294, 30–1296, 30–1332, 30–1349, 30–1355, 30–1356, 30–1357, 30–1358, 30–1367, 30–1370, 30–1413, 30–1545, 30–1551, 30–1552, 30–1567, 30–1584, 30–1616, 30–1652, 30–1683, 30–1697, 30–1717, 30–1727, 30–1898, 30–1901, 30–2049, 30–2050, 30–2054, 30–2061, 30–2062, 30–2133, 30–2134, 30–2427, 30–2499, 30–2506, 30–2645, 30–2773, 30–2799, 30–2811, 30–2812, 30–2813, 30–2814, 30–2824, 30–2830, 30–2896, 30–2990, 30–3061, 30–3062, 30–3086, 30–3095, 30–3131, 30–3174, 30–3177, 30–3210, 30–3231, 30–3233, 30–3284, 30–3336, 30–3344, 30–3716, 30–3745, 30–3765, 30–3845, 30–3853, 32–337–1, 32–368–1, 30–3349, 30–3353, 30–3356, 30–3364, 30–3367, 30–3473, 30–3513, 30–3622, 30–3723, 30–3728, 30–3819, 30–3849, 30–4122, 30–4143, 30–4153, 30–4158, 30–4167, 30–4187, 30–4355, 30–4499, 30–4607, 30–4628, 30–4674, 30–4702, 30–4818, 30–4843, 31–266, 31–310, 31–332, 32–211–1, 32–234–2, Tr. 4320, Tr. 4908, Tr. 15537, Tr. 8896–8897, 30–3345, 500–1–27, 500–1–28, 500–1–29, 500–1–42, 500–1–79, 500–1–86, 500–1–106, 500–1–112, 500–1–113, 500–1–114, 500–1–116, 500–1–181, 500–1–117, 500–1–124, 500–1–125, 500–1–193, 500–1–248, 500–1–249, 500–1–307, 500–1–329, 500–1–331, 500–1–411, 500–1–423, 500–1–442, 500–177–2, 30–1942, 30–3236, 30–3339, 30–4535, 30–2600, 30–2592, 30–2577, 30–2583, 30–2256, 30–2259, 30–2201, 30–2243, 30–2260, 30–2272, 30–3428, 30–3157, 30–3158, 30–3196, 30–3623, 30–2550, 30–2543, 30–2529, 30–2535, 30–4583, 30–2896, 30–2894, 30–2886, 30–2868, 30–2863, 30–2862, 30–2854, 30–4668, 30–4302, 30–2106, 30–2404, 30–2405, 30–2407, 30–2406, 30–2412, 30–2292, 30–2293, 30–2300, 30–2287, 30–2447, 30–2370, 30–2605, 30–2614, 30–2772, 30–2791, 30–2793, 30–2828, 30–2831, 30–4058, 30–2474, 30–2487, 600–x–34, 600–x–36, 30–4762, 30–2901, 30–5036, 30–4566, 30–1971, 30–1972, 30–1973, 30–2571, 30–4541, 30–4786, 30–5027, 601–x–1370, 601–x–1698, 601–x–1712, 601–x–1439, 601–x–1440, 601–x–1441, 601–x–1442, 601–x–1444, 601–x–212, 601–x–213, 601–x–1368, 500–1–397, 30–3839, 30–4247, 30–4486, 601–x–1711, 601–x–1360, 30–3858, 30–3923, 30–4778, 30–2432, 30–3850, 30–2593, 30–3728, 30–2270, 30–1995, 30–2209, 30–3036, 30–2832, 30–2472, 30–2439, 30–2438, 30–2397, 30–2389, 30–4300, 30–4326, 30–1076, 30–4712, 30–2103, 30–3806, 30–1730, 30–1446, 30–3220, 30–3235, 30–4335, 30–4337, 30–4362, 30–4394, 30–4443, 30–4528, 30–4709, 30–1651, 30–2410, 30–2289, 30–3877, 30–2601, 30–3160, 30–3598, 30–2912, 30–1332, L30–5025, 30–4280, 30–1416, 30–1453, 30–1457, 30–1616, 30–1998, 30–1999, 30–2131, 30–2142, 30–2184, 30–2233, 30–2250, 30–2304, 30–2395, 30–2396, 30–2423, 30–2431, 30–2736, 30–2829, 30–2889, 30–2891, 30–2992, 30–3003, 30–3254, 30–3334, 30–3393, 30–3551, 30–3597, 30–3791, 30–3882, 30–3936, 30–3944, 30–3974, 30–3977, 30–3999, 30–4464, 30–4532, 30–4539, 30–4544, 30–4629, 30–4657, 30–4667, 30–4669, 30–4980, 30–5034, 30–5076, 30–5095, 30–5101, L30–4952, L30–4953, L30–5096, 30–3497, 30–1938, 30–1989, 30–2217, 30–2384, 30–2403, 30–2403, 30–2416, 30–2480, 30–2486, 30–2555, 30–2556, 30–2607, 30–2639, 30–2734, 30–2735, 30–2873, 30–2878, 30–3578, 30–3742, 30–3776, 30–4325, 30–4452, 30–4790, L30–4998). A discussion of the relationship between the requirements of this final rule and the NLRA can be found in the Legal Issues section of this preamble.

As has already been discussed, the potential value of employee contributions to the development, implementation, and evaluation of an ergonomics program is well-established. The intent of the proposed requirement that employees have ways to be involved in developing, implementing, and evaluating each program element was to allow employers to take advantage of this potential value to construct and administer the most effective program possible.

A requirement that employees be involved in the program in no way abrogates the authority of the employer to manage the workplace or administer the ergonomics program. Regarding employee suggestions, this general requirement of the final rule for employee involvement requires only that employers provide a reasonable opportunity for employees to be heard, for them to be involved, and for their suggestions to be fairly considered. An employee recommendation made as part of this process, in and of itself, does not oblige the employer to take action. For example, if an employer asks employees in a problem job for recommendations about eliminating or controlling MSD hazards, the employer is not compelled to adopt any of the suggestions that the employees may make. Rather, this is an opportunity for the employer to draw on the knowledge of these workers in identifying and examining alternative approaches to addressing hazards. The suggestions of employees may be used to supplement those of professional staff or consultants.

Along with the authority for making decisions, the employer retains the responsibility for ensuring the effectiveness of the program. If consultation with employees about the effectiveness of the program reveals, for example, that training has not been understood, then this deficiency must be promptly corrected (see paragraph (u) of the final rule).

OSHA realizes that the input of employees will not in every instance prove to be beneficial to the ergonomics program. Nevertheless, the evidence in the record shows that contributions to the success of ergonomics programs have consistently been made by participating employees. The involvement of employees need not be cumbersome or time-consuming. Brief discussions are often sufficient to elicit employee input.

The proposal would have required that employees have ways to be involved in developing, implementing, and evaluating each element of the ergonomics program. The final rule requires that employees be involved in developing, implementing, and evaluating the program; however, reference to ''each element'' of the program has been deleted. This change has been made to grant the employer flexibility to adapt employee involvement to the circumstances in a given workplace. OSHA is convinced that the proposed level of employee involvement is not practical or justified in every instance. The Agency never intended for employee involvement to pervade every aspect of the program. As explained in the preamble to the proposal, the ''elements'' referred to were the broad ergonomics program elements (*e.g.* training, program evaluation). A requirement for employee participation in each component of these elements, such as supervisory training, was not envisioned. OSHA considers, however, that even greater latitude is appropriate in order to allow the employer to most effectively construct and administer the ergonomics program. For example, a small employer could adopt a training presentation developed by a trade association even if employees in that workplace did not participate in the development of the presentation. The Agency believes, however, that such circumstances are the exception rather than the rule, and has retained the requirement for employee participation in the development, implementation, and evaluation of the ergonomics program due to the evidence of the value of worker involvement in each of these stages in the administration of the program.

OSHA considers that the development of an ergonomics program is not an event, but a continuing process. The work environment is rarely static; work methods and equipment often change over time, and as a result the physical demands upon workers and associated MSD hazards can change as well. Likewise, hazard control methods and training procedures can evolve over time. Changes in the workforce can also impact the effectiveness of an ergonomics program. The program may require adjustments to account for these changes. For example, if ergonomics training is conducted in English in a workplace where the employees speak and understand English, it may be effective. If that employer subsequently hires employees who do not understand English, an adjustment would be necessary to provide the training in a language the employees understand. Similarly, if new equipment is brought into a workplace, modifications to the ergonomics program may be necessary to control MSD hazards related to use of the new equipment or to provide appropriate training. It is in these types of situations, as well as in the initial creation of the ergonomics program, where the record demonstrates that the involvement of employees can prove invaluable.

In response to those employers who were concerned that the proposed standard would necessitate discontinuation of successful programs that did not incorporate employee involvement in their development, OSHA does not intend for the requirement in the final rule for employee participation in the development of ergonomics programs to apply retroactively to programs that have already been established. The Agency believes that such a requirement would result in an unnecessary expenditure of resources to duplicate the existing program. Rather, OSHA believes that the evaluation of the effectiveness of the existing program will result in the identification and correction of any deficiencies which may currently exist, and that employee involvement in the ongoing development of the program will result in continuous improvement in the program over time. Moreover, OSHA anticipates that the grandfather clause in paragraph (c) of this final rule will apply to many existing programs.

A successful ergonomics program also requires employee involvement in its implementation. Clearly, hazard controls cannot be effective if workers do not use them, and MSD management cannot be effective if injured workers do not report their injuries. A program cannot fulfill its objectives if it exists only on paper, and is not applied in the workplace. Ample opportunity is provided to demonstrate employee involvement in the implementation of the program through compliance with the specific requirements of the standard. For example, if a job has been found to be an MSD hazard due to repetition, and the appropriate control method has been determined to be rotating jobs so that no single employee spends more than three hours per day in that job, the employer must ensure that employees carry out the job rotation in order for it to be effective as a control measure.

Employee involvement in the evaluation of the ergonomics program is also needed to assure program effectiveness. For instance, workers in problem jobs are in the best position to determine if control measures are successfully controlling MSD hazards, or if new hazards have been created. Employees are also best able to recognize when training is inadequate

or when opportunities for reporting of MSD hazards or MSD signs and symptoms are unsatisfactory. As with employee involvement in the implementation of the program, opportunities to demonstrate employee involvement in the evaluation of the program can be found in the specific requirements for evaluation found in the standard, such as the requirement of paragraph (m)(4) for consultation with employees regarding the effectiveness of controls and the requirement of (u)(1)(i) for consultation with employees on effectiveness and problems with the program.

OSHA does not believe that employee participation in the ergonomics program under this final rule will result in adverse repercussions on collective bargaining relationships. The final rule also does not require employers in any way to circumvent any process that may currently exist for employer communication with the employee. The rule does not specify a precise mechanism that must be used for employee participation. Where a system is already in place, such as a union/management safety and health committee, nothing in this rule prohibits an employer from using that system to meet its employee participation obligations.

Paragraph (j)—What Must I Do To Determine Whether a Job That Meets That Action Trigger Poses an MSD Hazard to Employees in That Job?

This paragraph addresses the job hazard analyses employers must perform to identify those MSD hazards that must be controlled under this final standard. Paragraph (j)(1) of the final standard requires employers with jobs that meet the standard's two-part action trigger—*i.e.,* who have employees who have experienced an MSD incident and who work in jobs that have risk factors present at levels that meet the screen in Table W–1—to conduct a job hazard analysis of the job to determine whether it presents an MSD hazard to employees. (Employers who qualify for and choose to use the Quick Fix option contained in paragraph (o) of the standard must follow the procedures of that paragraph and are not required to conduct the job hazard analysis specified in this paragraph (j).)

Paragraph (j)(2) tells employers what steps they must include in a job hazard analysis, and paragraph (j)(3) lists the methods of job hazard analysis that are acceptable under the rule, including referring to a number of tools, included in Appendices D–1 and D–2 of the standard, that employers can use to conduct their analyses. Paragraph (j)(4) explains that if the job hazard analysis shows that hazards need to be reduced, the job is terms a ''problem job'' under this standard.

The proposal's job hazard analysis provisions listed the steps required to analyze a job, and contained a list of 20 physical work activities and conditions associated with particular risk factors. The proposal did not provide specific guidance on how to determine whether the risk factors presented an MSD hazard in any particular case. Several commenters argued that the proposal's approach was vague and asked for more specific measures for identifying MSD hazards (see, *e.g.*, Exs. 500–197, 30–2435, 30–973, 30–1274, 30–2426, 30–1350, 30–2428, 30–2986, 30–3000, 30–3086, 30–3853, 30–326, 30–546, 30–4189). Others (*e.g.,* Ex. 30–3593) thought that the requirements in the proposed job hazard analysis section were too specific, and still others stated that the table oversimplified the complex interactions between various risk factors in a job and urged OSHA to eliminate the table of physical work activities from the final rule (see, *e.g.,* Ex. 30–3436). The argument made by several commenters was that the work activities and risk factors included in the table in the proposal would be hard for employers to identify in the workplace (see, *e.g.,* Exs. 500–197, p. III–12, 30–3745, 30–2134, 30–2426, 30–2919).

Although some provisions in final paragraph (j) are essentially the same as the corresponding sections of the proposed rule, several have been revised in response to comments that the proposal did not provide enough information on how employers could determine whether MSD hazards were present. In particular, the inclusion of the tools in this rule provides employers with much more assistance in compliance than the job hazard analysis provisions in the proposal (proposed sections 1910.917 and 1910.918) would have, while preserving a high degree flexibility for employers who do not choose to use any of the listed tools. In addition, the final rule has been modified to allow employers additional flexibility in several aspects of the job hazard analysis process. The following discussion describes each provision of paragraph (j) of the final rule and OSHA's responses to the comments received on the proposed job hazard analysis provisions.

Paragraph (j)(1)

Paragraph (j)(1) of the final rule states that employers must conduct a job hazard analysis to determine whether a job that meets the action trigger presents an MSD hazard to employees in that job. This requirement is essentially identical to the job hazard analysis obligation in Section 1910.917 of the proposed rule. Like the proposal, the final rule does not require the employer to perform a job hazard analysis for every reported MSD, but only for those that meet screening criteria. Unlike proposed Section 1910.917, however, Paragraph (j)(1) also permits an employer to rely on a job hazard analysis that was conducted previously for the job, provided that the analysis was performed in accordance with the procedures of this paragraph (j) and is still relevant to the job (*i.e.*, the job has not been altered in the meantime in a way likely to change or increase exposure).

The purpose of job hazard analysis is threefold: (1) To identify all the ergonomic risk factors that are associated with the job being analyzed; (2) to measure the duration, frequency and magnitude of employee exposure to these risk factors; and (3) to evaluate the risk factors identified, individually and in combination. This analysis allows employers to determine if the job poses an MSD hazard to employees, *i.e.*, is a ''problem job,'' as that term is used in the standard. The results of the job analysis, which identify the extent of the risk factors present in the job, can later be used as the benchmark against which to measure the effectiveness of controls.

The NIOSH publication, Elements of Ergonomics Programs (Ex. 26–2), describes a job hazard analysis as an examination of the workplace conditions and individual elements or tasks of a job to identify and assess the risk factors that are reasonably likely to be causing or contributing to the reported MSDs. OSHA received many comments supporting its proposed approach to job hazard analysis (see, *e.g.*, Tr. 5342, Tr. 8978, Exs. 37–1, 37–25, 500–218, 500–137–1–1). OSHA thus believes that the requirements of paragraph (j) are consistent with the objectives and steps of job hazard analysis as the process is currently applied by employers with effective ergonomics programs.

The quality of the job hazard analysis performed is critical to the success of the entire ergonomics program, as the United Auto Workers noted:

> The heart of an ergonomics program is the measurement of risk factors on jobs. The presence of risk factors demonstrates that a reported MSD is related to a job or workstation, while their absence suggests the MSD arose from other causes. Risk factors predict MSDs will arise in the future, even if none are currently reported. And, reductions in risk factors indicate that a job has been improved (Ex. 500–220).

A job hazard analysis can also rule out jobs that do not need to be controlled, and can provide employers with the information they need to prioritize their efforts on the most hazardous jobs or tasks that pose the most severe problems. Similarly, a job hazard analysis is an efficient way to help employers focus their resources on the most likely causes of a problem. For example, after analyzing a job, the employer may find that the amount of repetition is acceptable if the force and awkward posture in the job can be controlled sufficiently.

Despite these benefits, several commenters (see, *e.g.*, Exs. 30–1393, 30–1275, 30–3061, 30–3062) were concerned that the standard's requirements for job hazard analysis would be too costly. Typical of these comments was one from the Navy Federal Credit Union:

> The requirement for employers to perform job hazard analyses is extremely onerous and costly. It requires every employer to perform hazard analyses on the same or similar jobs within their industry. OSHA has already amassed a substantial amount of data on the likely causes and remedies of MSDs that occur in the workplace. The ergonomics standard should permit employers to rely on OSHA's identification of hazards and possible remedies for problem occupations (Ex. 30–1273).

Other employers, such as August Mack Environmental, Inc., disagreed, however:

> I do agree that conducting a hazard analysis, if done properly and very objectively, requires significant resources. However, if the result were to find that MSD risk factors were not prevalent, and the need for full implementation of a comprehensive ergonomics program were eliminated, this [expense] could easily be justified. This is due to the estimated amount of resources required for the hazard analysis compared to the resources required to implement a formalized ergonomics program and maintain it over time (Ex. 30–240).

Other record evidence also makes clear that the cost of MSDs far exceeds the costs of controlling MSD hazards (Tr. 7122, Tr. 10225, Tr. 4811).

Similarly, some commenters also expressed concern that performing job hazard analysis could be too difficult for small companies (see, *e.g.*, Exs. 601–x–1, 30–3469, 30–2846). However, OSHA's experience is that small companies can and do conduct these analyses effectively. For example, Wood Pro Industries in Cabool, Missouri is a VPP employer with only 100 employees. Its safety director (David Carroll, who also wears a number of other hats) began a safety and health program that identified and controlled ergonomic risk factors several years ago. The program has resulted in a decrease of almost 40% in workers' compensation costs (mostly due to reductions in MSD hazards), with premium costs declining from $103,824 to $61,000, which Mr. Carroll described as ''not chicken feed for a small company'' (Ex. 502–17). Based on this record, OSHA agrees with those who commented that an appropriate job hazard analysis actually limits MSD hazard control costs, either by determining that no MSD hazard is present or by identifying risk factors that, in turn, allow the company to focus on the activities that are associated with the MSD incident.

The UAW also has experience with small companies that have implemented ergonomics programs:

> Employers in the many small facilities have voluntarily or through the collective bargaining process, adopted a common approach to preventing ergonomic injuries and abating ergonomic risk factors in the workplace. The program includes all components established in the proposed standard, except appropriate medical management and that can be established without hindering the established processes at the facilities (Ex. 500–220).

Other commenters argued that the proposed approach to job hazard analysis would require the employer to hire a consultant (see, *e.g.,* Exs. 30–3783, 30–2810, 30–3336, 30–715, 30–2834). For example, the Texas Association of Business and Chamber of Commerce stated:

> Because the proposed standard inadequately defines the alleged ''risk factors'' or ''conditions or activities'' or even to provide a complete list of the ''conditions or activities'' during which the ''MSD hazards'' allegedly occur, small employers will be forced to seek assistance—at substantial cost—from those with experience and knowledge in the ergonomics field. In addition, the proposed standard does not adequately explain which controls will abate particular hazards and they will again be forced, and as encouraged by OSHA, to seek expensive outside help (Ex. 30–2810).

But contrary evidence is also in the record:

> I am not an ergonomist and I do not believe you need an ergonomist to do a general check on the risk factors of most jobs, that most workers, especially if you give them a framework for thinking about and analyzing their own job, can tell you where those risk factors are present, where they're not present, where they're present in large quantities versus small quantities. You do not need to be an ergonomist to do that. Many workers are extremely capable, if you give them a framework for analyzing their own jobs * * * (Tr. 13764).

A recent study in the record (Ex. 500–71–64) reports that trained workers were able, in 65 to 85% of cases, to identify the same risk factors as hired ergonomists and to successfully identify solutions.

The job hazard analysis required by Paragraph (j) of the final rule serves a very different function from the Basic Screening Tool in Table W–1 of the standard. The Basic Screening Tool is a simple hazard identification tool that can be used to identify jobs with the *potential* to expose workers in them to ergonomic risk factors at levels that *may* pose an MSD hazard. It cannot take the place of a job hazard analysis. It can only point to possible problems with the job; it takes a job hazard analysis to determine whether controls are actually necessary. A job hazard analysis identifies specific risk factors, or combinations of risk factors, that need to be controlled.

Paragraph (j)(1) also allows employers to rely on a previously conducted analysis of a job if it was performed in accord with the requirements of this paragraph, and the analysis is still relevant. This provision responds to concerns expressed by some participants that employers that the standard would require significant action every time a new MSD occurred, even if a job hazard analysis that complied with the standard had already shown that no additional controls are necessary (*e.g.,* Ex. 30–3956). To take advantage of this provision, the employer must confirm that the job is still being performed in the same way, and that the same risk factors are still present. Any changes to the work methods or equipment may have introduced new MSD hazards, and a new job hazard analysis would then be required. Additionally, if new employees are present, the employer must make sure that no new employee is performing the job in a different way or has physical characteristics that expose that employee to risk factors not present for others. For example, a particularly tall or short employee might need to work in a more awkward position, or reach further than others in order to perform the same tasks. If that is true, the employer must analyze the job to identify the risk factors affecting that employee.

The ''new employee'' situation described above is one of the scenarios addressed by the Note to paragraph (j). That note allows the employer to limit the job hazard analysis (and response) to the employee who reported the MSD incident when the MSD hazard is limited only to that employee. Evidence in the record points to situations in which the physical work activities or conditions of a job pose a risk to only a single employee (see, *e.g.,* Exs. 30–

4709, p. 6, 500–145, 30–2208). For example, a five-foot tall employee in a commercial bakery may report a back or shoulder MSD related to extended reaches involved in sorting rolls. However, other, taller, employees who have performed the job for several years do not have (and never have had) difficulty performing the physical work activities of the job. In this case, the employer could conclude, based on the job hazard analysis, that the problem is limited to the injured employee. The employer then may limit the further action required by the standard (*e.g.,* analysis, control, training, recordkeeping, evaluation) to that employee's workstation.

A similar situation could occur where one employee is much taller than others in the same job. The tall employee reports persistent back pain that rises to the level of an MSD incident, and the employer observes that having to bend much further than the other employees to work at the work surface is likely to have caused the back problem. Allowing employers to limit the analysis and control to a single employee if the analysis reveals that the problem is unique to that employee is consistent with the approach taken by several commenters who have successful ergonomics programs (see, *e.g.,* Exs. 30–1071, 30–3755, 30–3745). As one of these commenters reported, ''we have often modified the job to fit that one individual—however, modification was not needed for co-workers at similar or identical duty stations'' (Ex. 30–1071).

Paragraph (j)(2)

Paragraph (j)(2) of the final rule describes the steps the employer must take in performing the job hazard analysis. Paragraph (j)(2)(i) states that the employer must talk to the employees who perform the job, and their representatives, about tasks that may relate to the MSD incident. Paragraph (j)(2)(ii) requires the employer to observe the employees performing the job to identify the risk factors and assess the extent of their exposure (its magnitude, frequency, and duration) to those risk factors. The employer must include all of the employees performing the job, or a sample of those with the greatest exposure to risk factors, in this analysis.

According to the record (see, *e.g.,* Exs. 26–2, 26–5, 26–1370, 37–1, 37–25) effective job hazard analyses have the following steps or activities in common:

- Obtaining information about the specific tasks or actions the job involves;
- Obtaining information about the job and problems in it from employees who perform the job;
- Observing employees performing the job;
- Identifying specific risk factors in the job; and
- Evaluating those factors (*i.e.,* their duration, frequency and magnitude) to determine whether they are causing or contributing to the problem.

The job hazard analysis requirements of the final rule reflect these steps. Unless the employer qualifies for and chooses the Quick Fix Option in paragraph (o), the employer must use the job hazard analysis process in this paragraph to determine whether the physical work activities and job conditions pose an MSD hazard to workers in that job. Jobs that pose an MSD hazard to employees are called ''problem jobs,'' and must be controlled in accordance with paragraphs (k) through (m) of this final rule.

When employers perform a comprehensive job hazard analysis, their goal is to identify those ergonomic risk factors that impose biomechanical stress on the worker and evaluate magnitude, frequency, and duration as required by paragraphs (j)(2)(ii) and (j)(3). Once the risk factors and their magnitude, frequency, and duration have been determined, the employer is required to assess whether the risk factors identified pose an MSD hazard to employees. The standard defines an MSD hazard as the ''presence of risk factors in a job at a level of magnitude, frequency, and/or duration that is reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid.'' Ergonomic risk factors are the elements of MSD hazards, and they often work synergistically. That is, jobs that have multiple risk factors pose a greater risk, all things equal, than a single risk factor.

Paragraph (j)(2)(i)

Paragraph (j)(2)(i) of the final rule requires employers to talk with employees and their representatives about the tasks the employees perform that may relate to MSDs. Much has been written about the value of employee participation in the identification of risk factors and controls at the hazard analysis stage (see, *e.g.,* Exs. 3–232, 26–4, 26–11, 26–15, 26–18, 26–19, 26–21, 26–1370, 26–1420, 32–339–1–42, 38–32). Studies have shown substantial improvements in health and safety after participatory ergonomics programs are implements (*e.g.* Ex. 32–38). A comment from Johnson & Johnson sums up the opinion of many participants:

> Hazards cannot be addressed efficiently without an accurate evaluation of the situation. The line employee is one of the best sources of this information * * * [those employees are] local process experts (Ex. 3–232).

The record contains considerable evidence that many employers talk to employees to get insight into the job requirements that only those who work at the job can provide (see, *e.g.,* Exs. 30–3755, 30–3748, 500–117, 500–137–1–1, 500–137–6–1, 500–218, 500–220, Tr. 3890, 13808). These commenters stated that talking with employees is often the best way to identify the causes of the problem and to identify the most cost-effective solutions to it (see, *e.g.,* Ex. 26–1370). One stated:

> Employee participation is vital to this element. Job Safety Analysis (JSA) [another name for job hazard analysis] has been part of the safety vocabulary for many years. Many employers are working with the workers to determine the safest way to do a job. Controlling a hazard can be a productive tool in many ways. Minimize lost time; reduce training and overtime; and a positive outlook from the workplace. A worker who is set up to succeed is a productive worker. A worker who has to jury rig or perform a task that leaves him or her in discomfort at the end of every shift can not be productive for a prolonged period of time. (Ex. 500–137)

Discussions with employers who have set up ergonomics programs in response to corporate settlement agreements with OSHA also confirm the need for employee input into the job hazard analysis process (Ex. 26–1420). A number of these employers said that employees need to be involved in the analysis and control process because ''no one knows the job better than the person who does it'' (Ex. 26–1420, See also Ex. 3–164). Other evidence echoed this concept, confirming that employees often have the best understanding of what it takes to perform each task in a job, and thus, what parts of the job are the hardest to perform or pose the greatest difficulties: ''The people that are closest to doing the work seem to come up with the best solutions.'' Tr. 4697.

In addition to helping to ensure that the job hazard analysis is accurate, involving employees can make the job hazard analysis and control process more efficient, because employees can help employers pinpoint the causes of problems more quickly. Employees often come up with some of the most practical, no-cost or cost-effective, solutions (see, *e.g.,* Ex. 26–Tr. 1370, 2136, 2582, 12297).

Some participants opposed this provision, however (see, *e.g.,* Exs. 30–3344, 30–74, 30–3557). Several expressed concern that asking

employees about ergonomic problems would influence the employees' response, with the result that specious problems would be identified:

> This section is a regulatory ''Field of Dreams.'' Ask it and they will answer. Sooner or later, for reasons good, bad, or indifferent, somebody will answer ''yes'' [when asked if the job presents physical difficulties]. (Ex. 30–74)

Another participant was concerned that employee comments would vary from employee to employee and thus not be useful (Tr. 8861). Finally, several commenters argued that the employer and employee should not discuss the risk factors present in ''normal job activities'' because doing so might cause employees to feel that there should be no stress on the job (Exs. 30–3354, 30–3848).

OSHA continues to believe that employees' views add significant value to the job hazard analysis process and, in fact, that not asking employees about their perception of the tasks that may cause MSDs would be akin to performing a quality survey without involving the customer. Therefore, the final rule requires the employer to talk with the employees who perform the task when conducting this step of the job hazard analysis process.

OSHA is, moreover, providing enough flexibility in this provision to accommodate employers' concerns. OSHA is not requiring employers to use any particular method to talk with employees about the tasks they perform. Employers may do something as simple as talking with employees informally while observing the job being performed, or they may choose to talk with employees as part of a regular staff or production meeting. Alternatively, employers may have affected employees fill out a survey form or questionnaire. Many employers have developed effective tools for gathering important job information from employees who do the job. For example:

> AMP Inc., a manufacturer of electronic components, with 300 employees, uses a one-page ''Ergonomic Evaluation Form'' that asks employees to answer simple ''yes/no'' questions about the employee's ease and comfort when performing certain job tasks. After the company's ergonomic team (comprised of line employees) reviews the form, a member of the team interviews the employee. (Ex. 26–5).

In addition, there are ways to ask questions that respond to the concerns expressed above. The questions may be posed to minimize bias. For example, questions like ''Are parts of your job more difficult than others?'', ''Does your injury hurt more when performing certain tasks?'', or ''Could you recommend improvements to the job?'' tend to elicit useful information and do not prejudge the answer (Exs. 32–339–1–82, 500–121–61). In any event, the employee input is only one aspect of the job hazard analysis. The employer need not place great weight on the views of a single employee when those views are inconsistent with the rest of the information obtained during the analysis.

The final rule adds the language ''and employee representatives'' to this provision consistent with the practice in the rest of the rule to include the ''employee representative'' language included in each provision of the standard where OSHA is requiring such participation. The proposal took a more general approach to this issue, *i.e.*, it would have required employers to decide when including employee representatives was important in ''developing, implementing, and evaluating the employer's program'' (64 FR 66070).

A few commenters also stated that the appropriate focus for a job hazard analysis is the task rather than the job and objected to OSHA's use, in the proposal, of the word ''job'' in connection with the component to be analyzed in a job hazard analysis (see, *e.g.*, Exs. 32–300–1, 30–3755). OSHA agrees, and the language of the final rule uses ''tasks'' instead of ''jobs'' when referring to the units of analysis in this process.

Paragraph (j)(2)(ii) requires employers to observe the employees performing the job to identify the risk factors in the job, and to evaluate the magnitude, frequency, and duration of exposure to these risk factors. Job observation allows the employer to see how the employee does the job and provides information about the workstation layout, tools, methods, equipment and general environmental conditions in the workplace. A number of commenters recognized the value of this step (Ex. 30–3755). This paragraph of the final rule combines paragraphs (c) and (d) of proposed section 1910.918. Observing the employees at work is important because it allows employers to see precisely which tasks may be imposing biomechanical stress on the worker. Observation is a necessary addition to the discussion required by paragraph (j)(2)(i) because some things may be overlooked in the discussion, or employees may not remember to mention certain activities (particularly those that are short term).

There are several ways employers may comply with the observation requirement in paragraph (j)(2)(ii) of the standard, and participants described how they integrate job observations into their job hazard analysis (see, *e.g.*, Tr. 8171, Tr. 11133). First, employers may simply observe employees perform the job tasks; this is often all it takes to identify the problem. For example, watching a data processor reaching to use the mouse because the keyboard tray is not long enough to accommodate it may be all it takes to identify the likely cause of the employee's shoulder pain. Videotaping the job is another common practice for observing jobs (see, *e.g.*, Ex. 32–198–4). A number of employers, especially in situations where the work activities are complex or the causes of the problem not be easily identifiable, report that they videotape or photograph the job (see, *e.g.*, Ex. 26–1370; Tr. 3059, 4696, 6979, 7075, 5805, 5540, 10183).

The value of simply looking at people performing a job was demonstrated graphically at the hearing. A law firm representing a number of participants showed several ergonomist witnesses pictures of two workers seated at computer workstations (Ex. DC 42), and asked the witnesses to identify the risk factors observable in the photo. Virtually all of the witnesses (Tr. 1754, Tr. 1756, Tr. 2249, Tr. 2325–2327, Tr. 5397, Tr. 9045, Tr. 13228, Tr. 13235, Tr. 13307, Tr. 13762) explained that it would normally be necessary to ask the employees in the jobs reflected in the photos pertinent facts about the job before being able to determine with any certainty whether the exposure represented in the snapshot posed an MSD hazard to the worker:

> Well, again, it would go back to what they were doing. If they were doing this job for a long period of time (Tr. 928).

Nonetheless, when pressed to give the best answer possible based on the limited amount of available evidence, the witnesses reviewing the photos were surprisingly consistent in their identification of ergonomic risk factors across witnesses. The table below summarizes the witnesses' responses to the snapshot.

Risk factors—shorter worker	Identified by	Risk factors—taller worker	Identified by
Contact Stress	Armstrong (TR. 928), Alexander (TR. 2249), Fernandez (TR. 5384), LeGrande (TR. 9047), Brossard (TR. 13221), Robbins (TR. 1362).	Awkward neck posture	Armstrong (TR. 929), Alexander (TR. 2250), Fernandez (TR. 5380), Brossard (TR. 13228), Rich (TR. 9590).
Static Posture	Armstrong (TR. 928), Fernandez (TR. 5384), LeGrande (TR. 4096), Rich (TR. 9592).	Static posture	Fernandez (TR. 5380), Rich (TR. (9592).
Awkward neck posture	Alexander (TR. 2250), Fernandez (TR. 5385), Brossard (TR. 13224).	Awkward wrist posture	Rich (TR. 9598).
Awkward back posture	LeGrande (TR. 4096), Brossard (TR. 13225), Rich (TR. 9601).	Awkward back posture	Brossard (TR. 13227).
		Awkward knee posture	Fernandez (TR. 5381), Brossard (TR. 13226), Rich (TR. 9596).
		Contact Stress	Brossard (TR. 13230).

Although the participants who questioned these experts later claimed that the exchanges demonstrated ''erratic inconsistency'' in the identification of MSD hazards among OSHA's own experts (Ex. 500–197 at II–23), OSHA believes they show just the opposite: that it is often possible to identify risk factors easily even with only limited knowledge of the employee's activities. If the witnesses had had access to the extra information they all agreed was necessary, OSHA expects that there answers would have demonstrated much more uniformity.

''Same Jobs''

Paragraph (j)(2) of the final rule requires that employers include in the job hazard analysis (and control process) not only the injured employee's individual job but also all other jobs in the establishment that are the ''same'' as that job. ''Same jobs'' are jobs that involve the same physical work activities and tasks as the job that the injured employee performs, regardless of their job title or classification. (See the definition of ''job'' in paragraph (z)). All same jobs in the establishment must be included in the job hazard analysis and control process, even if they are performed at different locations or on different shifts. The standard, however, does not require employers to apply the job hazard analysis and control process to same jobs in other establishments.

The proposed rule contained an analogous provision, which a number of commenters supported (Exs. 30–4200, 500–215, Tr. 12894). For example, Suzanne Rodgers, a nationally recognized ergonomist who has been helping companies to develop effective ergonomics programs for more than 32 years, wrote in Occupational Medicine:

> The questions asked on site will give a good appreciation of the overall demands of the job * * * It is important, therefore, to look at more than one person doing the job, so individual methods can be assessed and the degree of individual control is known (Ex. 500–121–61).

Other commenters, however, objected to including all same jobs in the analysis (Exs. 30–2208, 30–3765, 500–145). For instance, Larry Feeler, a physical therapist and president of WorkSTEPS, Inc., said that including all same jobs would be too burdensome and costly for employers (Ex. 500–145). And P.J. Edington, of the Center for Office Technology, was concerned that it would be difficult for some employers to determine whether employees were performing the ''same job'' and that OSHA compliance officers might mistakenly classify all office work jobs as the ''same job'' (Ex. 30–2208; see also Ex. 500–197). Some commenters urged OSHA to limit the job hazard analysis requirement only to the injured employee's individual job (see, *e.g.*, Exs. 500–145, 30–2208), or only to other employees on the same shift (see, *e.g.*, 30–3765).

For several reasons, OSHA believes the requirement to analyze other jobs that are the same as that in which an MSD incident occurred is necessary to the final rule. At the same time, OSHA acknowledges the commenters' concerns and has included additional explanation and examples of ''same jobs'' in this preamble section, as well as providing flexibility for employers who have a large number of employees in the same job. The requirement is important because it helps to make the final rule more proactive and preventive. It ensures that employees performing the same physical work activities or tasks as someone who already has been injured are provided with protection before they too are hurt. As one commenter put it, the first injured employee may well be a ''harbinger'' of other MSDs among employees in the same job (Ex. 30–3755).

Second, it is likely that other employees performing the same job will need protection since the job has already been shown to involve exposure levels that are associated with increased risks of injury. As explained in the discussion of paragraph (f), jobs that meet the Basic Screening Tool generally pose a risk of MSDs that is three times higher than jobs that do not. Third, the requirement is necessary to ensure that employers have complete information about the hazards in the job. If the job hazard analysis is limited to the injured employee's job, employers may not get the information necessary to identify the causes of the problem accurately. Without this information, the control measures employers implement might not be successful in controlling or reducing the hazards to the required levels.

In any event, OSHA believes that the ''same job'' requirement will not impose undue burdens on employers. As the Note to this paragraph explains, like the proposal, the requirement does not apply where employers have reason to believe that an MSD hazard only poses a risk to the employee who experienced the MSD incident. Commenters generally supported this limitation (Exs. 30–4540, 30–1353, 500–145). Similarly, where employers have reason to believe that MSD hazards are present in only a subset of the same jobs, then employers would be permitted to limit their response to that group. For example, where it is clear that the size or width of the grip on a knife poses a hazard only for employees with small hands (*i.e.*, need for high hand force in order to hold knife), the employer would be free to limit the analysis to employees with small hands.

In addition, in most establishments, relatively few employees perform the same job. This is especially true for small employers. However, even where many employees at an establishment perform the same job (*e.g.*, telephone operators, letter sorters, package sorters, package delivery, beverage delivery, trash collectors, janitors, hotel maids),

the final rule gives employers the option of including only a sample of those employees in the analysis.

Some commenters asked OSHA to clarify when jobs are the same (see, *e.g.*, Ex. 30–3784). Jobs are the same when workers perform the same physical work activities or same job tasks. Employees perform the same job when the discrete elements or physical actions they perform are the same, even if not every aspect of their jobs is identical. For example,

- Employees whose jobs involve picking up packages from one conveyor and putting them onto another are performing the same job, even if the packages contain different products, or are placed on different conveyors.
- Orderlies whose job tasks involve lifting and moving patients have the same job even though some characteristics of the patients, room layout and the purpose of the lift or move may vary each time.
- Garbage collectors who pick up trash cans and recycle bins, and dump their contents into the garbage truck, have the same job even though their routes are not identical (*e.g.*, variations in terrain, traffic, distance from residences).

On the other hand, just because the workstations, tools and equipment employees use is the same does not mean that these employees have the same job. For example:

- Employees who use VDTs do not have the same job where one employee's job involves steady typing for most of the workday while the other employee uses the VDT to read and send electronic messages for only a few hours a day.
- Employees in an automotive assembly plant who use glue guns or staple guns do not necessarily have the same job if they are assembling different aspects of the product (installing seats versus windshields), particularly if they use the tools in different ways, with different force, and in different positions.

For purposes of this standard, job titles or classifications do not determine whether employees are in the same job. Where employees are performing the same physical work activities or tasks, they are in the same job even if they have different job titles. Often jobs involving the same physical work activities may have different job titles if there are working supervisors, some kinds of seniority systems, or different work shifts. For example, a ''Fabricator II'' on the third shift may be performing the same physical work activities as a ''Junior Fabricator II'' or ''Apprentice Fabricator'' on the first shift.

At the same time, just because employees have the same job title does not mean that the employer must include them in the job hazard analysis if the job tasks are not the same. This is especially true when employers have general job classifications, such as office worker, assembly line workers, production staff. ''Office workers'' may be assigned to tasks as varied as answering phones, operating copy machines, filing, or typing. If the MSD incident affected an office worker typing documents, the employer would only need to include in the job hazard analysis other office workers whose work task is to type documents. Likewise, ''lineworkers'' or ''production workers'' in a poultry processing plant may perform very different tasks.

Sample of Employees

Paragraph (j)(2) also gives employers the option to include in the job hazard analysis only a sample of the employees in the same job. Where the employer elects to use a sample of employees, the sample must include those employees with the greatest exposure to the ''relevant risk factors'' (*i.e.,* those risk factors that exceed the levels on the Basic Screening Tool). The proposed rule also included a similar option and many commenters supported it (see *e.g.,* Exs. 30–3344, 30–3745, 30–3749).

OSHA believes that this option should help to reduce burdens for employers while at the same time ensuring that the analysis of risk factors exposure in the job is accurately characterized and not underestimated. Some commenters, including Anheuser-Busch and United Parcel Service reported that they had dozens to hundreds of employees in their establishments who perform the same job (Exs. 32–241). This option also should help establishments employing telephone operators, customer service representatives, catalog sales representatives, data processors, trash collectors, warehouse selectors, grocery store cashiers, meatpackers, poultry processors and others. Including every employee in these ''same jobs'' in the job hazard analysis may be unnecessarily resource intensive, especially where the workstation layouts and tools are identical (Ex. 500–145). Employers may be able to identify the problem and possible controls after analyzing the jobs of only a handful of employees.

This option will also help in situations where jobs are of short duration or do not have fixed workstations (*e.g.,* visiting nurses, home health aides, home repairmen, furniture movers, beverage delivery, package delivery, utility line workers, trash collectors) (Exs. 30–339–22, 30-3714, 32–234–2–1, 500–73, 500–147–33, Tr. 14300). Changes in job locations and job conditions may make it very difficult to analyze the job of each employee. However, analyzing the job for a sample of employees allows employers to identify the MSD hazards facing all of the employees.

OSHA is requiring employers to sample those employees with the greatest exposure to the relevant risk factors to ensure that exposure levels in the job are characterized accurately. OSHA has used the concept of ''representative sampling'' for hazard identification purposes in several of its standards, such as the asbestos standard (29 CFR 1910.1001), the formaldehyde standard (29 CFR 1910.1048), and the lockout/tagout standard (29 CFR 1910.147). The principle behind this concept is that, if the job hazard analysis (or the exposure monitoring, in the case of chemical exposures) reveals that the exposures to this group of most highly exposed workers are not at levels of concern, it is likely that those of other lesser exposed workers will also not be of concern.

A few participants disagreed that the representative sampling option would be useful to reduce burdens for employers:

> OSHA concedes that ''conducting a job hazard analysis that covers all employees in a problem job may be burdensome'' * * * It is not possible for an employer to know of and account for the multitude of physical factors that affect the way its employees work. A sample selected, for instance, could inadvertently ignore the employee with the widest fingers, the smallest feet or the most sensitive hearing, in violation of the proposed rule. OSHA's ''shortcut'' for performing a job analysis is to us insignificant and illusory—employers will, in practice, have to observe virtually every employee in the problem job—a task that even OSHA admits can be burdensome (Ex. 500–197).

OSHA does not believe that employers will have difficulty identifying the employees in a job who are most likely to have the greatest exposure to the risk factors. The specific criteria in the Basic Screening Tool will be particularly useful in helping employers identify, for example, those employees who:

- Repeat the same motion for the longest continuous period during the workshift;
- Lift the heaviest objects or packages or the most objects per workshift;
- Have the greatest degree of flexion or extension of their wrists;
- Use vibrating hand tools for the most time during the workshift; and

• Make the longest reaches during the workshift.

In addition, the body location component in the Basic Screening Tool will help employers identify whether particular physical capabilities, limitations and characteristics may be relevant in selecting the sample of employees for the analysis. For example, employers do not need to consider the width of employees' fingers when it is kneeling or squatting for more than 2 hours that has triggered the need for job hazard analysis. And foot size is not relevant when the risk factors being addressed are vibration, intensive keyboarding, or high hand force.

Moreover, once the people responsible for conducting job hazard analyses have been trained in the hazard identification and job hazard analysis process, their knowledge of ergonomic risk factors and the causes of MSDs will help them determine which employee physical capabilities and limitations may be relevant. They will understand that, if the relevant risk factor is awkward posture associated with bending down to monitor a gauge positioned close to the floor, the employees with the greatest exposure would be those who are taller. And if the risk factor is awkward posture caused by reaching above the head, then shorter employees and those with short reaches would be the most exposed.

Risk Factors

Paragraph (j)(2)(ii) requires employers to identify the risk factors present in the job and to evaluate their magnitude, frequency, and duration. These risk factors include force, repetition, awkward postures, vibration, and contact stress. Unlike the proposal, the final rule does not include cold temperature and static postures as independent risk factors. In addition, contact stress and vibration are defined somewhat more narrowly than they were in the proposal. 64 FR 65808.

Force. Force refers to the amount of physical effort that is required to accomplish a task or motion. Force also refers to the degree of loading to muscles and other issues as result of applying force to perform work. Tasks or motions that require the application of higher force place higher mechanical loads on muscles, tendons, ligaments, and joints (Ex. 26–2). Tasks involving high forces may cause muscles to fatigue more quickly. Some commenters were unclear about the meaning of fatigue in the context of MSDs (see, *e.g.,* Ex. 30–3866). The common use of fatigue, of course, is as a synonym for ''tired.'' However, ergonomics has its roots in engineering, where fatigue has a meaning closer to ''breaking point,'' as in metal fatigue. In other words, fatigue, when used in the context of ergonomics, generally means that the muscle is no longer able to work and must be allowed to recover, or that the point of damage or deformation of a tissue has been reached. Thus, in ergonomics, the term implies more than simply being tired or uncomfortable. The force required to complete a movement increases when other risk factors are also involved. For example, more physical effort may be needed to perform tasks when the speed or acceleration of motions increases, when vibration is present, or when the task also requires awkward postures. Hand tools that require use of pinch grips require more forceful exertions to manipulate the tool than do those that permit use of power grips.

Force can be assessed qualitatively or quantitatively. Quantitative measures include strain gauges, spring scales, and electromyography to measure muscle activity. A qualitative assessment of force is based on direct observation of the amount of physical exertion required to complete a task, and is usually graded on an ordinal scale (*i.e.,* low, medium, high).

Repetition. Repetition refers to the frequency with which a task or series of motions is repeated over and over again with little variation in movement. When motions are repeated frequently (*e.g.,* every few seconds) for prolonged periods such as several hours or an entire work shift, fatigue and strain of the muscle and tendons can occur because there may be inadequate time for recovery. Repetition often involves the use of only a few muscles and body parts, which can become extremely fatigued even though the rest of the body is unaffected.

Repetitive motions occur frequently in manufacturing operations where production and assembly processes have been broken down into small sequential steps, each performed by different workers. Repetition is also present in many manual handling operations, such as warehouse operation and baggage handling. Repetition is typically assessed by direct observation or videotaping or as a percent of task cycle time, where a cycle is a pattern of motions.

Awkward postures. Awkward postures are positions of the body (*e.g.,* limbs, joints, back) that deviate significantly from the neutral position [9] while job tasks are being performed. For example, when a person's arm is hanging straight down (*i.e.,* perpendicular to the ground) with the elbow close to the body, the shoulder is in a neutral position. However, when employees are performing overhead work (*e.g.,* installing or repairing equipment, grasping objects from a high shelf) their shoulders are far from the neutral position. Other examples include wrists bent while typing, bending over to grasp or lift an object, twisting the back and torso while moving heavy objects, and squatting. Awkward postures often are significant contributors to MSDs because they increase the exertion and the muscle force that is required to accomplish the task, and compress soft tissues like nerves, tendons, and blood vessels. As used in the final rule's basic screening tool, awkward postures may be either static postures held for prolonged periods of time, or they may occur repetitively.

Awkward posture is the primary ergonomic risk factor to which employees are exposed when the height of the working surfaces is not correct. Working in awkward postures increases the amount of force needed to accomplish an exertion. Awkward postures create conditions where the transfer of power from the muscles to the skeletal system in inefficient. To overcome muscle inefficiency, employees must apply more force both to initiate and complete the motion or exertion. In general, the more extreme the postures (*i.e.,* the greater the postures deviate from neutral positions), the more inefficiently the muscles operate and, in turn, the more force is needed to complete the task. Thus, awkward postures make forceful exertions even more forceful, from the standpoint of the muscle, and increase the amount of recovery time that is needed.

Awkward postures are assessed in the workplace by observing joint angles during the performance of jobs tasks. Observed postures can be compared qualitatively to diagrams of awkward postures, such as is done in many job analysis tools, or angles can be measured quantitatively from videotape recordings.

Contact stress. Contact stress results from activities involving either repeated or continuous contact between sensitive body tissue and a hard or sharp object. The basic screening tool in the final rule includes a particular type of contact stress, which is using the hand or knee as a hammer (*e.g.,* operating a punch press or using the knee to stretch carpet during installation). Thus, although

[9] Neutral posture is the position of a body joint that requires the least amount of muscle activity to maintain. For example, the wrist is neutral in a handshake position, the shoulder is neutral when the elbow is near the waist, and the back is neutral when standing up straight.

contact stress is covered in the final rule as a single risk factor, it is really a combination of force and repetition. Mechanical friction (*i.e.,* pressure of a hard object on soft tissues and tendons) causes contact stress, which is increased when tasks require forceful exertion. The addition of force adds to the friction created by the repeated or continuous contact between the soft tissues and a hard object. It also adds to the irritation of tissues and/or to the pressures on parts of the body, which can further inhibit blood flow and never conduction.

Contact stress commonly affects the soft tissue on the fingers, palms, forearms, thighs, shins and feet. This contact may create pressure over a small area of the body (*e.g.,* wrist, forearm) that can inhibit blood flow, tendon and muscle movement and nerve function. The intensity of exposure to contact stress is usually determined qualitatively through discussion with the employee and observation of the job.

Segmental vibration. Vibration refers to the oscillatory motion of a physical body. Segmental, or localized vibration, such as vibration of the hand and arm, occurs when a specific part of the body comes into contact with vibrating objects such as powered hand tools (*e.g.,* chain saw, electric drill, chipping hammer) or equipment (*e.g.,* wood planer, punch press, packaging machine). Although using powered hand tools (*e.g.,* electric, hydraulic, pneumatic) may help to reduce MSD risk factors such as force and repetition, the tools can expose employees to vibration. Vibrating hand tools transmit vibrations to the operator and, depending on the level of the vibration and duration of exposure, may contribute to the occurrence of hand-arm vibration syndrome or Raynaud's phenomenon (*i.e.,* vibration-induced white-finger MSDs) (Ex. 26–2).

The level of vibration can be the result of bad design, poor maintenance, or the age of the powered hand tool. For example, even new powered hand tools can expose employees to excessive vibration if it they do not include any devices to dampen the vibration or in other ways shield the operator from it. Using vibrating hand tools can also contribute to muscle-tendon contractile forces owing to operators having to use increased grip force to steady tools having high vibration.

Vibration from power tools is not easy to measure directly without the use of sophisticated measuring equipment. However, vibration frequency rating are available for many recently designed hand tools.

Exposure to a single ergonomic risk factor may be enough to cause an MSD incident. For example, a task may require the exertion of so much physical force that, even though the task does not involve additional risk factors such as awkward postures or repetition, an MSD is likely to occur. For example, using the hand or knee as a hammer (*e.g.,* operating a punch press or using the knee to stretch carpet during installation) alone may expose the employee to such a degree of physical stress that the employee has a significant risk of a serious injury.

Generally, however, ergonomic risk factors act in combination to create an MSD hazard. Evidence in the Health Effects section (Section V) shows that jobs that involve exposure to multiple risk factors are likely to cause MSDs, depending on the duration, frequency and/or magnitude of exposure. Thus it is important that ergonomic risk factors be considered in light of their combined effect in causing or contributing to an MSD. This can only be achieved if the job hazard analysis and control process includes identification of all the ergonomic risk factors that may be present in a job. If all of the risk factors are not identified, employers will not have the information that is needed to determine the cause of the MSD incident or understand what risk factors need to be controlled to eliminate or reduce the MSD hazard in the job.

Based on its review of the scientific literature available at the time of the proposal, OSHA also identified prolonged sitting and standing (a form of static posture) and whole-body vibration as risk factors for MSDs; in addition, OSHA identified cold temperatures as a risk factor because it could require workers to increase the force necessary to perform their jobs (such as having to grip a tool more tightly) (64 FR 65808). The final rule does not explicitly include these risk factors. For prolonged standing and sitting, and for cold temperatures, although there is evidence of an increased risk of MSDs with exposure, the available evidence did not permit the Agency to provide sufficient guidance to employers and employees on the levels of exposures that warrant attention. For whole-body vibration, there was substantial evidence of a causal association with low back disorders (*e.g.,* see NIOSH 1997); however, heavy equipment and trucks, the most common sources of whole-body vibration, are seldom rated for vibration frequencies and intensities. In addition, measurement of whole-body vibration levels requires special equipment and training that would be difficult for most employers to obtain. Therefore, OSHA determined that it was appropriate not to include whole-body vibration in the final rule at this time.

Cold temperatures can, however, increase the effect of other risk factors. By reducing the dexterity and sensitivity of the hand, cold temperatures may cause a worker to apply more grip force to hold hand tools and objects. Also, prolonged contact with cold surfaces (*e.g.*, handling cold meat) can impair dexterity and induce numbness. Cold air blowing from a pneumatic tool, or a draft from the HVAC system, also can result in localized cold stress on the hands, arms, neck, or shoulder. Cold also increases the effects of vibration, such as in tree felling and cutting to length with a chainsaw on a cold day.

Performing a job hazard analysis includes determining the magnitude, frequency, and duration of employee exposure to the risk factors described above. These terms are discussed below.

Duration. Duration refers to the cumulative time an employee is exposed to one or more risk factor(s). The duration of exposure has a substantial effect on the likelihood of both localized tissue fatigue and general cardiovascular fatigue. (Again, the word ''fatigue'' is used in the ergonomics sense.) In general, the longer the period of continuous work (*i.e.*, the longer the task requires sustained muscle contraction), the longer the recovery or rest time required (Ex. 26–2). Changing the sequence of activities or the recovery time and pattern of exposure may mitigate the effects of long duration. Breaks or short pauses in the work routine help to reduce the effects of prolonged exposure.

Frequency. Frequency refers to the number of times the exposure is repeated within some unit of time, in contrast to duration, which relates to the cumulative length of exposure. This factor also can be obtained by observing and counting (either by video tape, in person, or mechanically) the number of repetitions or the cycle time associated with each task. The response of muscles and tendons to work is dependent on the number of times the tissue is required to respond and the recovery time between these responses. The frequency of an activity can be measured at the micro level, such as grasps per minute or lifts per hour. However, there are some tasks, such as lifting a 150-pound package or pushing a 400-pound beer barrel, where simply knowing that the activity occurs, say, on one day every week, is sufficient to establish that an MSD hazard is present.

Magnitude is a measure of the strength of the risk factor; for example: how much force, how deviated the posture, how great the velocity or acceleration of motion, how much pressure due to compression. Magnitude can be measured either in absolute terms or relative to an individual's capabilities. There are many qualitative and quantitative ways to determine the magnitude of exposure to ergonomic risk factor(s) (some of these measurement tools are provided in Appendix D–1). In relatively simple cases, one approach is to ask employees to classify the force requirements or physical difficulties posed by the job on a scale of 1 to 5, or on a scale as simple as ''low,'' ''medium,'' and ''high.'' When magnitude is assessed qualitatively, the employee is making a relative rating, *i.e.*, is rating the perceived magnitude of the risk factor relative to his or her own capabilities. Relative ratings can be very useful in understanding whether the job fits the employees currently doing the job.

There are a number of ways to measure the magnitude of exposure quantitatively (see, *e.g.,* Exs. 500–218, 500–220). For example, the NIOSH Lifting Equation is widely used to determine recommended weight limits for safe lifting and carrying (see, *e.g.*, Exs. 26–521). The Snook Push-Pull Tables are also used by many employers to evaluate and design pushing, pulling and carrying tasks (see, *e.g.*, Ex. 26–1008). For work-related upper extremity MSDs the Rapid Upper Limb Assessment (RULA) evaluation tool is often used to investigate and evaluate jobs (see, *e.g.*, Ex. 26–1421). These three tools are included in Appendix D–1, and are discussed at greater length in connection with that Appendix.

Paragraph (j)(3)

Paragraph (j)(3) of the final rule requires the employer to use one of the following methods or tools to conduct the job hazard analysis:

a. One or more of the hazard identification tools listed in Appendix D–1 of this section, if the tools are relevant to the risk factors being addressed; or

(ii) The occupation-specific hazard identification tool in Appendix D–2 of this section; or

III. A job hazard analysis conducted by a professional trained in ergonomics; or

(iv) Any other reasonable method that is appropriate to the job and relevant to the risk factors being addressed.

The final rule, like the proposal, requires employers to evaluate the ergonomic risk factors they have identified to determine whether the employee's exposure to them is the result of an MSD hazard or hazards in the job. To make this determination, employers must look at the duration, frequency and magnitude of the ergonomic risk factors in the job, as required by paragraph (j)(3). This evaluation may allow the employer to rule out some risk factors that do not pose a significant risk of injury, as well as to identify risk factors that do rise to the level of an MSD hazard. Risk factors are sometimes ruled out because the exposure does not last long enough, is not repeated frequently enough, or is not intensive enough to pose a risk. On the other hand, a job that requires significant bending from a neutral posture for most of the day would be identified as an MSD hazard by the appropriate hazard identification tool in Appendix D–1, and the job would therefore be labeled a ''problem job,'' as noted in paragraph (j)(4) of the standard.

The approach to hazard identification reflected in paragraph (j)(3) of the final rule differs from the proposed approach and responds to comments that objected to the proposed approach (see, *e.g.*, Exs. 32–300–1, 30–3032). The proposal included a table that listed 20 physical work activities and job conditions such as ''exerting considerable physical effort to complete a motion'' and ''using hand and power tools,'' linked each of these activities to a number of risk factors likely to be associated with the performance of such activities, and directed employers to evaluate these risk factors to determine whether an MSD hazard was present.

The National Telecommunications Safety Panel was one of many participants who found the proposed hazard identification approach unhelpful:

> The members of the Panel strongly believe that the matrix of ''physical work activities and conditions'' and ergonomic risk factors that may be present * * * provides insufficient guidance to be included as a mandatory item in a federal rule. (Ex. 30–3745).

A similar comment was that the proposed job analysis approach shifted the burden of hazard identification from OSHA to the employer (Ex. 30–4334). Commenting on this point, however, the AFL–CIO stated:

> * * * the obligation placed upon employers in the proposed ergonomics standard, as with other standards, is to eliminate or reduce an occupational hazard. In the proposed ergonomics standard, OSHA has defined ''hazard'' not in numerical terms but in descriptive terms: ''MSD hazards are physical work activities and/or physical work conditions,'' in which ergonomic risk factors are present, that are reasonably likely to cause or contribute to a covered MSD (Ex. 500–218).

Other commenters argued that the proposed approach to the identification of risk factors and MSD hazards was vague and that OSHA should instead provide a permissible exposure limit (PEL) for each risk factor and each possible combination of risk factors (see, *e.g.*, Exs. 500–197, 30–2435, 30–973, 30–1274, 30–2426, 30–1350, 30–2428, 30–3986, 30–3993, 30–3000, 30–3086). Since some employers have been very successful in using simple approaches, such as the one proposed, to identify and control MSD hazards, however, OSHA finds this argument unpersuasive. Risk factors and MSD hazards are being identified and addressed in thousands of workplaces every day, and employers and employees are using a wide variety of approaches to do so.

OSHA recognizes, however, that although certain of the risk factors described above are easy to identify and understand, others are not as apparent or observable. Employers who already have ergonomics programs and persons who manage ergonomics programs generally have no difficulty identifying risk factors in the workplace, because they have learned to look for them (see, *e.g.*, Exs. 30–3755, 500–220, 32–359–1, 32–210–2, 32–198–4, 30–3805, Tr. 11427). Because these individuals have training and experience, ergonomic risk factors are familiar concepts for them. Through the process of developing and implementing their ergonomics programs, these individuals have gained a good working knowledge of the ergonomic risk factors that are most likely to be present in their workplaces. For those employers who are just beginning their programs and have little or no training and experience dealing with ergonomic risk factors, OSHA has tried in the standard to make the process of identifying them as straightforward and easy as possible. For this reason, OSHA has provided employers with many different hazard identification tools in mandatory Appendix D–1 and mandatory D–2.

The large number of risk evaluation tools in the record and the many comments OSHA received on the proposed list of physical activities and conditions have led the Agency to include in the final rule several options for hazard identification that employers may choose from. Many commenters discussed hazard identification tools that are currently used by employers (see, *e.g.*, Exs. 500–200, 500–218, 30–3813, 30–276). Thus, the final rule allows a choice of hazard identification

approaches, including simple checklists, more structured assessment tools, and reliance on expert consultants.

The United Automobile Workers (UAW) submitted a number of checklists that its members use (Exs. 32–185–3–26, 32–185–3–33), and described several approaches to hazard identification that employers have used to identify ergonomic risk factors effectively (Ex. 500–220). These approaches include:

- Development of consistent methods to measure the physical stresses on the body. Stress is determined by the force exerted on a body part, the frequency of the motion and the posture of the joint. The Force-Frequency-Posture paradigm is common to both expert and checklist approach to ergonomics analysis.
- Development of simplified non-expert approaches to measurement of risk factors (checklists)
- Formulation of the NIOSH lifting guide and related biochemical models which take into account the weight of an object, distance from the body and motion of the body in lifting.
- Validation of symptom surveys and discomfort surveys (psychophysical measures) as risk factor identification tools
- Validation of the use of risk factor checklists and symptom surveys by workforce personnel to identify high risk jobs and propose abatement methods.

Dr. Don Chaffin, founder of the Center for Ergonomics at the University of Michigan, testified that the precision of many tools used to evaluate risk factors is very high (Tr. 8255–8286). Ms. Lisa Brooks, corporate ergonomist for International Paper, commented that there were many different analysis tools used throughout the company (Tr. 11427).

The AFL–CIO also commented on the widespread availability of risk factor evaluation tools (Ex. 500–218):

> Testimony and evidence in the record demonstrate the job analysis tools such as the NIOSH Lifting Equation and Snook—Ciriello Push-Pull Tables are widely utilized by employers, unions, consultants and others to evaluate exposure to ergonomic risk factors throughout a wide range of industries and businesses. Representatives of International Paper (Tr. 11425–26), Owens-Corning (Tr. 10856), Conti Group Corp. (Tr. 10788), Coca Cola (Tr. 14356) and Levi Strauss (Tr. 14710) testified that they routinely used these tools in their ergonomic programs to analyze jobs for ergonomic risk factors. Representatives from the UAW and UNITE! testified how these and other tools such as UAW–GM Check Lists were used by employers and union representatives to evaluate ergonomic hazards at Ford (Ex. 32–185–3–42; 46, Tr. 5827, 5828), GM (Tr. 5831), Maytag (Tr. 8062), VF Corp. (Tr. 7074), Owens-Corning (Tr. 10858), Levi Strauss (Tr. 14710), Coca Cola (Tr. 14356), PPG Industries (Tr. 3131).

OSHA has included several of these tools in Appendix D–1.

Paragraph (j)(3)(i)

Paragraph (j)(3)(i) of the final rule allows the employer to evaluate ergonomic risk factors using one or more of the hazard identification tools listed in Appendix D–1 of this section. Appendix D–1 list eight hazard identification tools: (1) The Job Strain Index (Ex. 26–883), (2) the NIOSH lifting equation (Ex. 26–572), (3) the UAW–GM checklist (Ex. 32–185–3–26), (4) the applicable ACGIH threshold limit values for physical agents (Exs. DC 389, 500–166–1, 502–273), (5) the Rapid Entire Body Assessment (REBA) (Ex. 500–121–26), (6) the Rapid Upper Limb Assessment (RULA) (Ex. 26–1421), (7) Appendix B to the final Washington State ergonomics standard (WAC 296–05174) (Ex. 32–210–2–99), (8) the Snook Push/Pull Hazard Table (Ex. 26–1008). Tools selected must be relevant to the risk factors being addressed. This means, for example, that an employer could not use the NIOSH Lifting Equation, which is appropriate for employees exposed to certain types of force, to analyze a job involving repetition and awkward posture.

A number of participants submitted evaluation tools to the record (see, *e.g.,* Exs. 26–2, 26–5, 32–77–2–1, 502–67, 26–883, IL–162–Q, 32–185–3–31, 500–142–12, OR–348–1, 32–185–3–26, 500–121–61, 38–260, IL–218, IL–228, 32–339–1–82, DC 417–6, 500–121–21, 38–93, 500–121–28, 32–111–1, 32–198–4–27–1), while others (see, *e.g.,* Exs. 500–220, 500–218, Tr. 5567) suggested that the final rule include tools, such as the Snook tables and the OSHA *Meatpacking Guidelines* (Ex. 30–2387). Still other participants merely asked the Agency to provide more guidance in the final rule for companies to identify ergonomics risk factors (see, *e.g.,* Exs. 30–276, 30–3818, 30–4290, 500–197, 500–218, 30–3864, Tr. 11601, Tr. 9070, Tr. 17419), and many commenters suggested that OSHA provide non-mandatory checklists (see, *e.g.,* Exs. 30–3765, 30–1671, 30–3284, 30–2387, 32–300–1, 30–519, 30–4844, 30–3032, 30–3748, 30–3813).

Based on this evidence, OSHA has decided to allow employers to demonstrate compliance with paragraph (j)(3) by using one or more of the tools in Appendix D–1, assuming it is appropriate to the risk factors being addressed for job hazard analysis purposes. These hazard identification tools were suggested by several commenters (see, *e.g.,* Exs. 30–276, 32–339–1, 500–218, 30–3813, 500–220, 30–3361, 30–2134, 32–210–2, 32–210–2, Tr. 5567, Tr. 8706, Tr. 10629, Tr. 16487). For example, Marathon Oil stated:

> Since the proposed rule is job-based (particularly targeted to problem jobs), OSHA should have reviewed the scientific literature to identify and publish exposure assessment methods capable of distinguishing problem jobs from non-problem jobs. In its proposed rule, OSHA fails to mention existing methods capable of such prediction (*e.g.* the Strain Index) or methods that have the potential for such predictions (*e.g.* the Revised NIOSH lifting equation) (Ex. 30–3361).

OSHA selected the tools in Appendix D–1 for several reasons. They were developed by professionals who have extensive training and experience in the identification, analysis and control of MSD hazards. For instance, the Snook Push/Pull Hazard Table was developed by Dr. Stover Snook , a certified professional ergonomist with a PhD. in experimental psychology, who has spent 38 years researching MSDs and 25 years teaching ergonomics at the Harvard University School of Public Health (Ex. 37–6).

The eight tools in Appendix D–1 are also well-documented. They are based on scientific evidence on the relevant risk factors, and most been published in peer-reviewed scientific journals (*e.g.,* Job Strain Index, NIOSH Lifting Equation, RULA, REBA, Snook Push/Pull Hazard Table). To illustrate, the steps in the Job Strain Index by Moore and Garg were based on the findings and data of a number of peer-reviewed studies, including the Borg CR–10 scale (Ex. 26–883). The summary and explanation of Appendix B to the Washington State Ergonomics Standard includes extensive discussion and tables documenting the scientific support for each element in that tool (Ex. 32–210–2–99).

The tools have also been tested, most of them extensively. For instance, to develop the Rapid Entire Body Assessment (REBA) tool, three ergonomists/physiotherapists independently coded 144 posture combinations and then incorporated the sensitizing concepts of load, coupling and activity scores to produce the final REBA score, with accompanying action levels (Ex. 500–121–26). Thereafter, two workshops were held involving 14 occupational safety and health processionals (including ergonomists, occupational therapists, physiotherapists and nurses) to code more than 600 additional samples of postures from several industries (*i.e.,* health care, manufacturing and

electrical) in order to further refine the REBA scores. There was between 62 to 85% agreement among the 14 professionals (Ex. 500–121–26).

Dr. Snook testified at the hearing about the years of extensive testing he did to develop the Push/Pull Hazard Table:

> Most of my experiments were psychophysical investigations of manual handling tasks, viz., lifting, lowering, pushing, pulling, and carrying. The purpose of these experiments was to collect hard data for use in evaluating the risk of manual handling tasks, and to aid in the redesign of these tasks. At the time, psychophysics was the only method that could yield usable data for task evaluation. Psychophysics is a very old method that is concerned with the mathematical relationship between sensation and their physical stimuli. Psychophysics has been applied to practical problems in many areas, including the decibel scale of loudness, and ratings of perceived exertion (RPEs) * * *
>
> My colleagues and I conducted eleven major manual handling experiments over a period of 25 years [citations omitted]. Each experiment lasted two to three years. These experiments were unique in hat they used realistic manual handling tasks performed by industrial workers (68 males and 51 females) over long periods of time (at least 80 hours of testing each subject). Physiological measurements of oxygen consumption and heart rate were recorded for comparison with psychophysical measurements. The experimental design also included 16 to 20 hours of physical conditioning and psychophysical training. A battery of 41 anthropometric measurements were recorded for each subject to insure that the sample was representative of the industrial population. The results of these experiments were combined and integrated into tables of maximum acceptable weights and forces for various percentages of the working population (Ex. 37–6).

These tools were also designed for use by persons with only minimal training in hazard identification. For example, Washington State said that it designed Appendix B particularly for small employers with limited resources who wanted ''maximum clarity and certainty.'' Washington State Appendix B includes illustrations of the relevant risk factors and a simple 5-step process for determining whether particular lifting tasks pose a hazard. The other tools in Appendix D–1 use similar approaches. For instance, the GM–UAW checklist uses a simple stars and checks approach to those tasks and activities that may warrant further investigation or controls.

Finally, OSHA has selected these eight tools because they all include specific and well-defined recommended criteria for when employers need to take action and when no further action would be necessary. As such, these tools address commenters' arguments that the standard must provide clear guidance to employers in identifying risk factors and knowing when they have done enough to control them (see, *e.g.,* Exs. 30–276, 30–3818, 30–4290, 500–197, 500–218, 30–3864, Tr. 11601, Tr. 9070, Tr. 17419). These tools specifically and clearly operationalize the table of physical work activities and conditions in the proposed rule so they answer commenters' repeated questions about what proposed terms such as ''over and over,'' ''considerable physical effort,'' ''long reaches'' and ''heavy'' objects mean. For example, the Job Strain Index (Ex. 26–883) defines ''over and over'' in terms of efforts per minute (number of exertions/total observation time). The NIOSH Lifting Equation defines a ''heavy'' object as weighing 51 pounds or more, and then shows users how to reduce the amount of weight that can be lifted within the equation's limits on the basis of particular conditions in the workplace.

There are tasks for which each of the evaluation techniques in Appendix D–1 are well suited and tasks where the tool is not appropriate. The following information explains the limits and appropriate uses for each tool in Appendix D–1.

Job Strain Index

The Job Strain Index is designed to identify jobs associated with MSDs of the hand. It does this by measuring or estimating six task variables: intensity or exertion, duration of exertion per cycle, efforts per minute, wrist posture, speed of exertion and duration of task per day (Ex. 26–883). The Job Strain Index and documentation supporting it was published in a peer-reviewed scientific journal.

Area of the body covered by the Job Strain Index: Hand/wrist.

Risk factors evaluated: Force, awkward postures, repetition (speed of work).

Examples of jobs that Job Strain Index is applicable to or well-designed for: Jobs involving high hand repetition, small parts assembly, keyboarding, inspecting (assembly line), sorting, meatpacking, sewing, packaging.

NIOSH Lifting Equation

The NIOSH Lifting Equation, which is already widely used, was developed to evaluate manual lifting demands. It provides an empirical method for computing a weight limit for manual lifting tasks to prevent or reduce the occurrence of lifting-related low back pain among workers. Six factors are used to determine the recommended weight for the specific working conditions: horizontal distance, vertical distance, travel distance, frequency, twist, coupling. Then the actual weight is compared with the recommended weight to determine the ''allowable'' lift index. The NIOSH Lifting Equation and documentation supporting it has been published in a peer-reviewed scientific journal.

Area of the body addressed by NIOSH Lifting Equation: Lower back.

Risk factors evaluated: Force (distance, coupling), repetition (frequency), awkward postures (location of the object, travel distance, twist).

Examples of jobs that NIOSH Lifting equation is applicable to or well-designed for: manual handling tasks involving objects weighing more than 10 pounds; forceful lifting tasks in production and assembly work; package sorting, handling, delivery and pickup.

ACGIH TLV Hand/Arm (Segmental) Vibration TLV

The ACGIH Hand/Arm (Segmental) Vibration TLV describes how to measure hand tool vibration and provides threshold limit values for exposure.

Areas of the body addressed: Hands, Arms/Shoulders.

Risk factors evaluated: Vibration.

Examples of jobs that the Hand/Arm (Segmental) Vibration TLV is applicable to or well-designed for: Jobs involving use of powered and vibrating hand tools (*e.g.,* grinding, sanding furniture, sawing, jigsawing, chain saws).

GM–UAW Checklist

The UAW–GM checklist was developed to evaluate a range of risk factors in production jobs. The checklist uses checks (√) and stars (*) to indicate whether the certain activities and conditions are present for less than or more than one-third of the production cycle or workday. The number of checks and stars, in conjunction with the report of an MSD, is used to determine if the job requires further investigation or control action.

Areas of the body addressed: Hand/wrists, Forearms/elbows, Shoulders, Neck, Back/Trunk, Legs/knees.

Risk factors evaluated: Force (including manual handling), Repetition, Awkward Postures (including Static Postures), Vibration, Contact stress

Examples of jobs that the GM–UAW checklist is applicable to or well-designed for: cyclical production and assembly work jobs.

RULA

The Rapid Upper Limb Assessment (RULA) was developed to evaluate

ergonomic exposures of the upper body. The range of motion for each body part (upper arms, lower arms, wrists, neck) is rated based on the amount of posture deviation. Posture combinations are ranked to reflect musculoskeletal loading with force, static work and repetition factors. RULA and documentation supporting it has been published in a peer-reviewed scientific journal.

Areas of the body addressed: Wrists, Forearms/elbows, Shoulders, Neck, Trunk.

Risk factors evaluated: Awkward posture, force, repetition.

Examples of jobs that RULA is applicable to or well-designed for: assembly and production work, janitorial and maintenance, meatpacking, restaurant, grocery cashier, telephone operator.

REBA

The Rapid Entire Body Assessment (REBA) is similar to RULA, but it has been modified to be more useful for the working postures found in the health care and other service industries. REBA and documentation supporting it has been published in a peer-reviewed scientific journal.

Areas of the body addressed: Wrists, Forearms/elbows, Shoulders, Neck, Legs/knees, Trunk, Back

Risk factors evaluated: Awkward posture, force (load and coupling), repetition.

Examples of jobs that REBA is applicable to or well-designed for: Patient lifting and transfer, assembly and production work, janitorial and maintenance work, meatpacking, restaurant work, grocery cashier, telephone operator.

Washington State Appendix B

The Washington State Appendix B was developed to determine if jobs that were in the Washington State ''caution zone'' actually pose an MSD hazard to employees in them. The checklist shows physical risk factors and lists duration (from 2 to 6 hours) by body part. If the work activities or conditions apply, the job poses an MSD hazard.

Areas of the body: Shoulders, Neck, Back, Trunk, Knees, Forearms, Wrists, Hands, Elbows.

Risk factors evaluated: Awkward postures, Force (including manual lifting and high hand force), Repetition, Contact Stress, Vibration.

Examples of jobs that Washington State Appendix B is applicable to or well-designed for: very wide range of jobs including patient lifting and transfer, assembly and production work, janitorial and maintenance, meatpacking, restaurant, grocery cashier, telephone operator, keyboarding, manual handling, meatpacking, jobs involving use of powered and vibrating hand tools, janitorial, solid waste.

Snook Push/Pull Hazard Table

The Snook Push/Pull Table is designed to identify whether pushing, pulling and carrying activities meet or exceed established maximum acceptable loads or force levels for those activities. It does this by examining initial and sustained forces of loads, horizontal distance, vertical distance, frequency and object weights. These measurements are compared with the tabled values corresponding to the task and considered acceptable for 75% and 90% of the adult male and female population. The Snook Push/Pull Table and documentation supporting it has been published in numerous peer-reviewed scientific journal articles. In addition, the table was used in developing the NIOSH Lifting Equation.

Body areas addressed: Back/Trunk, Legs, Shoulders.

Risk factors evaluated: Force, repetition, awkward posture.

Examples of jobs that Snook Push/Pull Hazard Table is applicable to or well-designed for: manual handling jobs involving pushing or pulling objects or carrying objects a long distance, and hospital laundry and janitorial jobs, among others.

Paragraph (j)(3)(ii)

Paragraph (j)(3)(ii) allows employers to use the video display terminal (VDT) hazard identification tool in Appendix D–2 of this section for jobs involving risk factors related to computer use. Appendix D–2 is a simple checklist to assess the physical activities and layout of workstations with a VDT. Like the tools in Appendix D–1, the VDT checklist was added to the final rule to address comments that the physical activities and conditions listed in the proposal were too vague to be used for job hazard analysis and control (see, *e.g.,* Exs. 500–197, 30–2435, 30–973, 30–1274, 30–2426, 30–1350, 30–2428, 30–2986, 30–2993, 30–3000, 30–3086, 30–3853, 30–326, 30–546, 30–4189, 30–3845).

The function of the checklist is to determine if the computer workstation and layout address the risk factors most commonly found in VDT jobs. The analyst using this checklist would talk with and observe the worker(s) while they are at the computer workstation. If a condition or activity in the job merits the checklist's ''Yes,'' the analyst would check the ''Yes'' box. If there are no more that two ''No'' answers to the checklist questions, the computer workstation design, layout or equipment needs no further evaluation or control to be in compliance with paragraph (j)(3)(ii).

Intensive computer use accounts for a significant number of MSDs each year and occupational computer use is growing. MSDs associated with computer use are reported in a wide range of industries (*e.g.,* telecommunication, telephone, banking, insurance, catalog and telephone sales, customer service, package delivery service, newspaper) and in businesses of all sizes, including very small establishments. OSHA believes that its VDT checklist provides these businesses with an easy and quick way to identify and control hazards in a large number of jobs.

OSHA designed this checklist after considering the many examples of computer workstation checklists in the record (see, *e.g.,* Exs. 26–2, 26–1517, 26–1337, 32–182–1–6, 502–313–3, IL–258, 500–142–10). The checklist is designed to provide employers with a simple way to identify the five risk factors this standard covers, as they most commonly occur in computer work and workstations. All the employer need do is check whether the risk factor is or is not present in the employee's working conditions and workstation equipment, and address those that are present.

The checklist provides clear and specific guidance in how the employer can provide or adjust a computer workstation so it will be comply with the control requirements of this standard. Each checklist item is written to provide the solution to the problem it identifies. For example, the checklist items addressing awkward neck postures actually show how to position the computer monitor to eliminate those postures (*e.g.,* ''Top line of screen is at or below eye level so employee is able to read it without bending head or neck down/back,'' ''Monitor position is directly in front of employee so employee does not have to twist head or neck,'' ''No reflected glare (*e.g.,* from windows, lights) is present which might cause employee to assume an awkward posture to read screen.'').

OSHA expects the VDT checklist to provide significant assistance for employers in industries where MSD hazards associated with computer use are the major, or even the only, MSD hazards they face. Unlike other checklists in the record, which include a range of risk factors such as vision and general environmental conditions, OSHA's checklist addresses only those

risk factors this standard covers. Second, the OSHA VDT checklist is also more flexible than some other checklists in the record because it is risk factor-based rather than equipment-based. In equipment-based checklists, employers get a passing score only if they have purchased and installed particular equipment at each computer workstation. OSHA's risk factor-based checklist, however, gives employers the flexibility of deciding how to best control the identified hazards. For example, an equipment-based checklist asks employers whether they have provided adjustable height tables and monitor risers. A risk factor-based checklist, on the other hand, asks employers whether the employees' heads and necks are in a straight rather than awkward positions (*i.e.,* bent down or back), when they look at the monitor screen. If an employer can achieve this result without purchasing new adjustable equipment, this will satisfy the standard. A number of participants said that they have controlled risk factors at VDT workstations without purchasing new adjustable equipment (see *e.g.,* Tr. 2707).

OSHA stresses that, like the other tools in Appendix D, its VDT checklist is only one of a number of methods employers may use to identify and control MSD hazards related to computer use. Employers are free to use other checklists in the record or to continue using whatever method they currently use to identify and evaluate MSD hazards associated with computer use, provided those methods address the risk factors this standard covers.

Paragraph (j)(3)(iii)

Paragraph (j)(3)(iii) allows employers to choose to have a job hazard analysis conducted by a professional trained in ergonomics. By a ''professional trained in ergonomics,'' OSHA means an ergonomist, safety professional, industrial hygienist, engineer, or other safety and health professional who has received training in the principles of ergonomics and their application in job hazard analysis and control. Reliance on a trained professional or competent person is a concept used in many OSHA rules, such as the Asbestos Standard (29 CFR 1910.1001), the Process Safety Management Standard (29 CFR 1910.119), and the Telecommunications Standard (29 CFR 1910.268).

A few commenters suggested that the final rule should require specific qualifications for those individuals permitted by the rule to perform job hazard analyses (see, *e.g.,* Exs. 30–4674, 32–210–2). OSHA rejected this idea because the record contains many examples of cases where employers and employees are doing an effective job of analyzing their jobs and then controlling them (see, *e.g.,* Exs. 32–377–2–1, 32–111–1, 32–198–4–27–1). In fact, OSHA believes that in about 85% of cases, managers, supervisors, and employees can, with some training in ergonomic principles and job hazard analysis, perform the required analysis of jobs in their workplace that have met the action trigger. Thus, OSHA believes that, in most cases, employers will be able to perform job hazard analyses without expert outside help, and that the sheer number of employers who have already established effective ergonomics programs on their own (Ex. 502–17) is testimony to the ability of companies to initiate a program without hiring a consultant. The record has many comments (see, *e.g.,* Exs. 502–17, 500–215, Tr. 11427, Tr. 1008, Tr. 13764) reporting that employers and employees are ''going it alone.''

The hazard identification method permitted by paragraph (j)(3)(iii), however, is based on the expert judgment of a safety and health professional trained in ergonomics and its application in the workplace. This job hazard analysis option, therefore, assumes that the employer has chosen to seek outside help (unless, of course, the workplace has such a safety or health professional on staff). Paragraph (j)(3)(iii) is unlike paragraphs (j)(3)(i) and (ii) in this respect. OSHA is aware that some employers (see., *e.g.,* Ex. 502–17) currently rely on outside experts or OSHA's consultation program for job hazard analyses. For most employers and most jobs, however, OSHA believes that employers will choose to develop the level of in-house expertise needed to implement the job hazard and control requirements of the standard.

Paragraph (j)(3)(iv)

Paragraph (j)(3)(iv) allows the employer the flexibility to use any other reasonable method of job hazard analysis that is appropriate to the job and relevant to the risk factors being addressed. This method could consist of a hazard identification tool of the type in Appendix D, or of a job hazard analysis methodology developed by the company itself. Many employers utilize trained workplace ergonomic committees to perform these job analyses. OSHA has included this job hazard analysis option in the final rule in recognition of the fact that other hazard identification tools and methods are effective in identifying MSD hazards, and that many employers have instituted effective ergonomic programs that include job hazard analysis methods that do not rely on ergonomist-consultants or on the tools in Appendix D. OSHA does not wish to stifle creativity or to foreclose the option to use existing hazard identification tools or methods that will get the job done.

If employers choose to avail themselves of the option in paragraph (j)(3)(iv), they must be sure that the method of job hazard analysis they choose is one that is reasonable and appropriate for the risk factors present, *i.e.,* the risk factors identified in the job by the Basic Screening Tool. For example, if the job requires the employee to sit in a chair and assemble cellular phones for 8 hours a day, then the method must be appropriate for seated work, hand/arm force, and the motions that are required by the job. A method that only measures strain to the back would clearly not be a reasonable method of job hazard analysis for this phone assembly job. Paragraph (j)(3)(iv) encourages employers to continue to use their own effective analysis techniques, provided they are appropriate, or to develop a tool that fits their needs.

Many participants submitted ergonomic risk factor evaluation tools that they have used in their workplaces to the record (see, *e.g.,* Exs. 26–2, 26–5, 32–77–2–1, 502–67, 26–883, IL–162–Q, 32–185–3–31, 500–142–12, OR–348–1, 32–185–3–26, 500–121–61, 38–260, IL–218, IL–228, 32–339–1–82, DC 417–6, 500–121–21, 38–93, 500–121–28, –3, 32–111–1, 32–198–4–27–1). For example, the Dow Chemical Company uses a method that measures posture, repetition, force and duration and takes into consideration frequency and environmental factors, such as lighting, for computer workstations (see, *e.g.,* Ex. 32–77–2–1). The Dow Chemical method provides for scoring of jobs based on the number of words typed or keystrokes per minute (frequency), the time spent doing the task (duration), and the amount of force or amount of deviated posture (magnitude) used by the worker to perform the task (see, *e.g.,* Ex. 32–77–2–1). The final score on the ''Dow card'' allows the person performing the job analysis (usually the employee in the job) to determine if there is a problem.

The United Steelworkers of America developed a survey as a job hazard analysis tool for bus drivers. The survey includes qualitative measurements of reach distances for the steering wheel, floor pedals, clutch, and door handles, as well as the force required to use work site tools. Seating support and visibility are also evaluated using the tool that has been developed to evaluate exposures for bus drivers see, *e.g.,* Ex. 32–111–1). Levi Strauss uses a checklist with measurements by body part for posture,

repetition, duration, force, and allows for other factors, such as the use of PPE, concrete flooring, kneeling, slippery floors, vibration and temperature that might be found in apparel industry jobs (see, *e.g.,* Ex. 32–198–4–27–1). These methods of analysis are applicable to the tasks and work environments for which they were developed because they measure the risk factors that are reasonably expected to be found in those tasks and jobs in their respective industries.

In fact, the record contains many examples of employers who are identifying and controlling ergonomics risk factors on a daily basis. Dow Chemical sites across the country have been recognized by OSHA and the Voluntary Protection Program (VPP) for their outstanding safety and health efforts. Their programs include the analysis of ergonomics risk factors:

> Dow analyzes tasks utilizing a risk evaluation card. This card looks at the various ergonomic hazards that may be present in our workplaces and rates these hazards by a relative risk index or weighting method. This weighting or indexing approach is consistent with other risk indices, which OSHA has supported or recommended. Indexing allows employers like Dow to prioritize its limited safety and health resources in such a way to get the most ''bang for the buck'' not only from an economic perspective concerning appropriate controls, but also from a risk perspective as well. Such an approach has been successful in our workplaces and has been borne out through our experience. Dow's recordable rates and incidence of MSDs are much lower than the general industry experience (Ex. 30–3755).

Employers are free to select the method or tool that best fits their own jobs, workplace conditions, and culture. A job hazard analysis is effective as long as it allows the person who is performing it to determine whether a job has risk factor(s) that rise to the level of an MSD hazard or does not pose an MSD hazard. Some employers reported using simple and fairly informal procedures to identify hazards in a job (see, *e.g.,* Tr. 17353, 2979). This was especially true for employers who have only limited or isolated ergonomics problems.

A job hazard analysis approach used by many employers is the narrative approach. This method of hazard identification is similar to job analyses used to identify other potential safety and health hazards (see, for example, OSHA's Process Safety Management Standard, 29 CFR 1910.119, which allows employers to use this approach). With the narrative approach, the employer and employee discuss the job requirements and the relationship (if any) between the tasks and the reported MSD. Where the problem identified through the narrative approach is easy to identify and control and the establishment has few MSDs, the employer may be able to use the Quick Fix option permitted by paragraph (o). If the Quick Fix method can be used, the employer does not need to continue with the job hazard analysis, although he or she must observe all the steps in the Quick Fix process. For more complex problems and solutions, the employer is required to comply with the requirements of paragraphs (k), (l), and (m) to control the MSD hazard identified.

In other cases, however, the problem may require a more detailed analysis that could involve breaking the task down into its various discrete elements or activities and then identifying and evaluating the extent to which employees are exposed to risk factors in these activities (see, *e.g.,* Ex. 32–210–2). The quantified risk factors are then compared to values that have been shown to contribute to the MSD hazard (*see, e.g.,* Exs. 26–2, 26–1247, 500–121–26, 32–210–2–99, DC–386, 500–121–21).

A job hazard analysis approach that is intermediate between the narrative approach and the detailed analysis discussed above is the use of a checklist. Checklists provide more structure than the narrative approach, but are less time consuming than a detailed job analysis. Several commenters suggested that OSHA include checklists in the standard (see, *e.g.*, Exs. 30–3748, 30–3755, 32–182–1, 30–3826, 30–3818). OSHA agrees that well-designed checklists, when used as intended, can provide an effective hazard identification approach for a range of employers, especially small business owners. There are many ways in which checklists are useful: identifying physical work activities and conditions, identifying ergonomic risk factors, evaluating jobs, prioritizing jobs for further analysis, and providing a method of evaluating the effectiveness of controls. The American Physical Therapy Association (APTA) endorsed the usefulness of checklists as a job hazard analysis option:

> In APTA's review, checklists would be an extremely helpful resource to small businesses conducting job hazard analyses. (Ex. 30–3748).

The following example of a job hazard analysis includes a combination of qualitative and quantitative observations and measurements (Ex. 38–438):

Title: Turkey processing—thigh boning.

Objective: Remove thigh bones from the turkey carcasses.

Standard: 540 thighs deboned per 8-hour shift, 15 minute a.m. break, 30 minute lunch, 15 minute p.m. break.

Workstation: Overhead conveyor, shackles 44 inches above the floor.

Equipment: Thigh boning knife; wire mesh glove for non-knife hand; optional rubber gloves for both hands; hard hat; smock; boots.

Methods: (1) Grasp and position thigh with non-knife hand, (2) Cut along thigh bone to separate meat from bone 2–3 cuts, (3) Cut remaining tendinous attachments (bone drops into conveyor as work release meat and bone.

Environment: Air-conditioned turkey plant; turkeys at 38°F, ambient air 45°F.

Risk Factors:

1. Forceful exertions—(knife hand) holding knife, cutting thighs, (non-knife hand) holding thighs for cutting. Force depends on user's technique, sharpness of the blade, worker's position relative to the moving turkey. Forces on the cutting hand are greater (up to 38 pounds) than the hand holding the thigh (up to 19 pounds). Holding hand is relaxed between cuts, while the knife hand continues to grasp the knife handle (4 pounds).

2. Repetition—4,320 cuts per hour, holding thigh 1,080 times per hour.

3. Awkward/Static posture—Wrist bent and forearm rotated while cutting thighs. The wrist is angled due to the straight knife, type of cut, location and orientation of the turkey.

Paragraph (j)(4) of the final rule simply states that jobs that have been determined, through the job hazard analysis process, to pose an MSD hazard to employees in that job are called ''problem jobs'' for the purposes of the standard.

OSHA finds, based on the comments, data, and other evidence on job hazard analysis in the record, that the job hazard analysis approach adopted in paragraph (j) of the final rule is widely used by employers and employees and is highly effective. Further, the hazard identification tools and methods permitted by this paragraph are commonly used in workplaces large and small, for workers with fixed and mobile worksites, and in the analysis of both traditional and ''non-traditional'' jobs.

Paragraph (k)—What Is My Obligation To Reduce MSD Hazards?

Paragraph (k) of the final ergonomics standard tells employers how far they must go in reducing MSD hazards at the workplace. This paragraph sets the control endpoint that employers must achieve. Final paragraph (k) presents

three options. Employers are in compliance with this paragraph when the controls they have implemented:

- Control the MSD hazards to the extent that they are no longer reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid,
- Reduce MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D that the employer used to conduct the job hazard analysis, or
- Reduce MSD hazards to the extent feasible.

As described in the Risk Assessment and Economic Analysis sections of this preamble, much evidence in the record demonstrates that employers with existing programs are able to successfully control the MSD hazards in problem jobs to a level where an MSD is reasonably unlikely to occur.

Paragraph (k) of the final rule does not require employers to eliminate all MSDs. OSHA recognizes that, in a number of jobs, workplaces, and physical work activities it may not be possible to eliminate MSDs. OSHA is also aware that employers who have an effective ergonomics program may still receive reports of MSDs. The goal of the final rule is to assure that employers take effective action to control MSD hazards, and paragraph (k) tells employers how far they must go in implementing controls.

Paragraph (k)(1)(i)

An employer is in compliance with paragraph (k)(l)(i) when it reduces MSD hazards to the extent that they are no longer reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid. The hazard analysis conducted under paragraph (j) will have identified the risk factors of concern. To control the MSD hazard, the employer must reduce the magnitude, duration, or frequency of the risk factors to the level where they are reasonably unlikely to cause such MSDs. There are several ways an employer can achieve this goal.

First, the employer can reduce ergonomic risk factors below the levels in the Basic Screening Tool. The final standard recognizes that risk factors below the levels in the screening tool are not reasonably likely to cause MSDs, and allows an employer to discontinue his or her ergonomics program if it has reached those levels.

Second, the employer can otherwise control the hazards such that they are reasonably unlikely to cause MSDs. In some cases, the needed controls may be obvious or readily discoverable by reference to compliance assistance materials. In other cases, judgment may be required. In any event, the employer may refer to the method it used under paragraph (j) to determine whether the job presents a hazard. For example, the employer may use a professional trained in ergonomics to conduct the analysis and determine whether job conditions present a hazard and to recommend measures to control the hazard. The employer can also make use of its own knowledge and experience gained under its program.

The employer may also use hazard identification tools. As described above in the explanation of paragraph (j), the employer may choose from a variety of such tools. Appendix D lists a number of specific tools that provide safe harbors for compliance under paragraph (k)(1)(ii); however, the employer may also consider other tools that are effective in identifying hazardous levels of exposure in determining what controls to implement.

These examples are not intended to be exhaustive. They are intended to illustrate means employers may use to ''control MSD hazards.''

Several points bear noting. First, the obligation is not to reach a level of absolute safety or to assure that no further MSDs will occur: it is to reduce the hazard so that work activities are not reasonably likely to cause MSDs. Second, the hazard reduction is targeted to MSDs that result in work restrictions (including days away from work) or medical treatment beyond first aid. These are serious conditions by any measure. Finally, the standard allows the employer to take up to two years to implement permanent controls. This extended period should be sufficient to allow for situations in which installation of effective controls requires a period of adjustment.

Paragraph (k)(1)(ii)

The second option is to reduce MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D that the employer used to conduct the job hazard analysis. This appendix is intended to give employers specific guidance to help them determine whether or not they have gone far enough in controlling MSD hazards. As discussed more fully below, many rulemaking participants felt that the proposed rule was vague and shifted the burden of determining how far to control MSD hazards to employers (see, *e.g.*, Exs. 30–1722; 30–3956, 35–106; Tr. 4110, 15648–15649) or suggested that OSHA provide, in the final rule, more guidance on how to make that determination (see, *e.g.*, Exs. 30–1557, 30–2987, 30–3748, 30–3765, 32–133, 32–300). OSHA has responded to these comments by allowing employers the option of controlling MSD hazards to the specific levels set out in Appendix D.

Paragraph (k)(1)(iii)

Paragraph (k)(1)(iii) of the final rule states that employers are in compliance with the endpoint if they have reduced the hazard to the extent feasible. This paragraph applies when it is not feasible for employers to reach one of the endpoints in paragraphs (k)(1)(i) and (ii). It is included because OSHA has no authority to require employers to do what is not feasible or ''capable of being done.'' *American Textile Mfrs. Institute* v. *Donovan (Cotton Dust)*, 452 U.S. 490, 509, 513 n. 31, 540 (1981). A control that will reduce a hazard in a job is feasible if it is achievable within the limits of current technology and knowledge and the employer's financial resources. An employer's inability to afford controls will not establish infeasibility if its level of compliance lags significantly behind the rest of its industry. See Section IV–A.6.a(4)(a) and (b) of OSHA's Field Inspection Reference Manual (CPL 2.103). See also, *United Steelworkers* v. *Marshall*, 647 F.2d 1189, 1269 (D.C. Cir. 1980).

OSHA is also requiring that employers who meet the compliance endpoint by being at the limits of feasibility, but have not fully controlled MSD hazards, periodically check to see whether new technology has been developed and is available. These checks must be carried out at least once every 3 years. When additional feasible controls are identified, the final rule requires employers to implement them until one of the compliance endpoints given in paragraph (k)(1)(i) or (k)(1)(ii) is reached. Requiring employers to look for and implement new control methodology ensures that an employer who has not fully controlled ergonomic hazards is not relying on obsolete control measures.

What Happens When a New MSD Is Reported After Controls Have Been Implemented?

Paragraph (k)(2) of the final rule tells employers what to do if an employee reports an MSD in a job in which the employer has implemented MSD hazard controls. If an employee makes such a report, the employer must check to see if the controls are still in place and are functioning and being used properly. The employer must also check to see if any new hazards exist that were not present when the job hazard analysis was conducted. The employer need not conduct another full job hazard analysis

but may undertake a review of the previous job hazard analysis to determine if it is adequate.

Sometimes, after ergonomic control measures have been implemented in a problem job, another employee will experience and report an MSD. The injury could be a sign that the controls are not functioning correctly or that new hazards have arisen. For example, an employer might have, among other things, installed adjustable keyboard trays at each VDT station and trained employees in their use. If one of the keyboard trays gets out of adjustment, the operator using that tray might experience and report tendinitis in his or her wrists. An employer following paragraph (k)(2) of the final rule would check to ensure that the keyboard tray is still present and is adjusted properly.

Note to Paragraph (k)

A clarifying note at the end of paragraph (k) explains that the occurrence of an MSD in a problem job is not in itself a violation of the standard. This note emphasizes that the focus of the final rule's compliance endpoint is on the control of MSD hazards and not on the elimination of MSDs from the workplace. OSHA recognizes that, for a number of jobs, workplaces, and physical work activities, it may not be possible to eliminate MSDs. OSHA is also aware that employers who have effective ergonomics programs may still receive reports of MSDs. The goal of the final rule is to have employers put a good working system into place so that they can take effective action to control MSD hazards.

The Proposed Rule

The proposed rule would have required employers to meet one of three compliance endpoints:

- Materially reduce MSD hazards in the problem job using the incremental abatement process;
- Reduce MSD hazards in the problem job to the extent feasible; or
- Eliminate MSD hazards in the problem job.

OSHA explained the first endpoint with a definition of ''materially reduce MSD hazards.'' The definition, which was repeated in a note following proposed § 1910.921(a), read as follows: '''Materially reduce MSD hazards'' means to reduce the duration, frequency and/or magnitude of exposure to one or more ergonomic risk factors in a way that is reasonably anticipated to significantly reduce the likelihood that covered MSDs will occur.''

The following paragraphs discuss the comments, evidence, and testimony received on the proposed compliance endpoint and present OSHA's reasons for accepting or rejecting the rulemaking participants' suggestions and for including the final rule's compliance endpoint requirements.

1. Comments That the Proposed Compliance Endpoint Was Vague

Many of the comments and much of the testimony OSHA received on the issue of compliance endpoints stated that the language used to set compliance goals was vague and confusing (see, *e.g.,* Exs. 30–333, 30–1722, 30–2208, 30–2387, 30–3765, 30–3813, 30–3853,30–3956, 30–4185, 30–4334, 30–4467, 32–300, 32–337, 440, 500–118, 500–188, 500–197, 500–221; Tr. 2960, 4109, 14986). In particular, these rulemaking participants argued that the related terms ''material reduction or elimination of MSD hazards'' and ''materially reduce the MSD hazards'' were so vague that employers would not know how far they had to go to control MSD hazards. For example, ORC said that those terms, together with the phrase ''reasonably anticipated to significantly reduce the likelihood'' in the clarifying note following § 1910.921(a), would prove to be compliance nightmares for employers and enforcement nightmares for OSHA (Ex 30–3813, 32–78). ORC claimed that the language in the note would breed unnecessary confusion. Further, Edison Electric Institute stated that the definition of ''materially reduce MSD hazards'' uses three terms, ''reasonably,'' ''significantly,'' and ''likelihood,'' that are themselves vague (Ex. 32–300). Several rulemaking participants believed that this vagueness would lead to unnecessary litigation (see, *e.g.,* Exs. 30–3813, 30–3956, 30–4185, 30–3853, 32–337). James Lancour, representing EEI, was concerned that the vagueness would cause employers difficulty in program and training development, stating:

> To provide reasonable program development and training one must clearly define the program endpoints and the steps to achieve these endpoints. The endpoints must also be objectively measurable to achieve the desired results. This proposed standard is so vague and ambiguous that neither the endpoints nor the measurement criteria are specifically defined.
>
> How does one develop an ergonomic program, give guidance in determining compliance and provide general and specific training to facility program facilitators, managers and supervisors and employees when the terms of compliance are so poorly defined? [Tr. 2897]

Some rulemaking participants argued that OSHA left the word ''feasible'' undefined (see, *e.g.,* Exs. 30–3956, 30–4334; Tr. 14986). For example, United States Senator Kit Bond observed that OSHA ignored comments from the Small Business Advocacy Review panel about the vagueness of the word ''feasible'' (Ex. 30–4334). The National Coalition on Ergonomics (NCE) stated that the lack of a suitable definition rendered the option to ''implement controls that reduce the MSD hazards to the extent feasible'' unclear (Ex. 30–3956). The Coalition said that OSHA had not provided any reliable guidance as to what ''feasible'' meant from either a technological or an economic standpoint. The Coalition believed that this left employers with no way of determining whether a particular hazard control was feasible for them.

Paul, Hastings, Janofsky, and Walker LLP also argued that the proposed standard's attempt at flexibility resulted in a standard using terminology full of ambiguity (Ex. 30–3231). The law firm believed that OSHA's enforcement staff would likewise struggle to understand the rule.

The National Coalition on Ergonomics (Ex. 30–3956) went further to suggest that the proposed language was so vague as to be unconstitutional:

> It is fundamental that ''a statute which either forbids or requires the doing of an act in terms so vague that men of common intelligence must necessarily guess at its meaning and differ as to its application, violates the first essential of due process of law.'' Connally v. General Constr. Co.. 269 U.S. 385, 39 (1926). [Footnote omitted.] Thus, an occupational safety and health standard must give an employer fair warning of the conduct it prohibits or requires, and it must provide a reasonably clear standard of culpability to circumscribe the discretion of the enforcing authority and its agents. Dravo Corp. v. OSHRC, 613 F.2d 1227, 1232, 7 BNA OSHC 2089 (3d Cir. 1980). [Footnote omitted.]
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> * * * * *
>
> The language and terminology used by OSHA in much of the proposed standard and Preamble is so vague and ambiguous that it fails to provide employers with adequate notice of what the standard will require and prohibit and, accordingly, is unconstitutionally vague. The proposed standard fails to provide employers with adequate notice as to the conditions, circumstances or activities in the workplace that cause MSDs and what employers must do to eliminate MSDs under the standard.
>
> The following is a partial list of terms which are either vague and/or undefined and fail to provide employers with notice of the required performance under the standard—''material reduction or elimination of MSD hazards * * *'' and ''ergonomic hazard.'' These terms are so ambiguous as to fail to provide employers * * * notice of what is required with respect to the fundamental provision of feasible control measures. [Ex. 30–3956]

The AFL–CIO (Ex. 500–218) believed that the proposed standard was clear and that employers would be able to successfully carry out the obligations imposed by it. The union countered some of the vagueness arguments in its post-hearing submission:

> Employers must control exposure to ergonomic risk factors to the point that covered MSDs are no longer ''reasonably likely to occur,'' in other words, to eliminate the ''MSD hazard,'' or reduce it to the extent feasible. * * *
>
> The record demonstrates that employers will be able to accomplish this task. Utilizing various tools and other available guidance, employers have been able to measure and evaluate exposure to ergonomic risk factors and identify and implement controls to reduce those exposures. There is plentiful testimony in the record demonstrating that employers are able to ascertain conditions that present an ergonomics hazard and to identify and implement measures to reduce or eliminate the hazard.
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> * * * * *
>
> The proposed standard is clear, and with the inclusion of the AFL–CIO's recommendations, will be even clearer, that an employer's obligation extends only to eliminating hazardous exposures at work. An employer's obligation to conduct job analysis and institute controls applies only where there is exposure on the job to an ergonomic risk factor or risk factors that occurs at a sufficient level of duration, intensity, or magnitude to present a risk of MSDs. Under OSHA's proposed screening criteria, an employer is only required to conduct a job analysis if there are ''physical work activities and conditions in the job'' that are ''reasonably likely to cause or contribute to the type of MSD'' being addressed, and ''[t]hese activities and conditions are a core element of the job and/or make up a significant amount of the employee's worktime.'' * * * If these screening criteria are not met, the occurrence of an MSD does not trigger any obligations on the employer's part. And the proposed standard limits an employer's control obligations to situations where there is substantial exposure to ergonomic risk factors on the job. If the employer's job analysis does not show the existence of a hazard, *i.e.,* exposure to ergonomic risk factors that are reasonably likely to cause or contribute to a covered MSD, the employer is under no obligation to institute controls. The standard clearly limits employers' obligations to situations where there is significant exposure in the workplace, and limits employers' obligations to addressing hazardous exposures at work. [Ex. 500–218]

Dr. Frank Mirer of the UAW also believed the proposed rule was clear based on General Duty Clause ergonomic settlement language that was similar to that in the proposal (Tr. 5932).

OSHA does not agree that the language of the proposed rule was impermissibly vague. Nevertheless, OSHA has changed the compliance endpoints to respond to the vagueness comments and provide greater clarity. OSHA believes that the language of the final rule's three endpoints gives employers clear and understandable guidance as to what they must do. Employers who achieve the objective ''safe harbor'' endpoints in Appendix D are assured they are in compliance. This avoids the problem most frequently raised by commenters: That the proposal did not give employers objective criteria by which to measure their compliance obligations. The objective criteria in the Basic Screening Tool give employers an alternate clear means of assuring they are in compliance. OSHA has also sought to clarify the general performance terms like ''MSD hazard'' and ''control MSD hazards'' used in the standard. OSHA has clarified that an employer may rely on a safe-harbor hazard identification tool, a professional consultation, or any other reasonable method to define whether a hazard exists requiring control. OSHA has also dropped terms, like ''incremental abatement process'' and ''material reduction,'' that commenters asserted were especially unclear.

a. *Comments that the language used in the proposed standard is so vague and subjective that it would lead to uneven enforcement.* Some rulemaking participants who claimed the proposed endpoints were vague were also concerned about the possibility that the alleged vagueness would lead to uneven enforcement (see, *e.g.,* Exs. 30–333, 30–1274, 30–3765, 30–3839, 30–3845, 30–4185, 440, 500–188, 500–197; Tr. 3330, 5439, 7211, 17891). They believed that the proposed definition of ''materially reduce'' and the corresponding explanation of that term in the preamble to the proposal would call for subjective judgments and would lead to disagreements between employers and OSHA enforcement staff. For example, The Forum for a Responsible Ergonomics Standard stated:

> Enforcement of the proposed ergonomics program standard would require a degree of subjectivity in determining compliance unprecedented in the Agency's history. This is because of the nature of the area regulated combined with the vagueness of the proposed standard's requirements.
>
> For example, proposed Section 1910.921 (a) provides that employers are in compliance if they implement controls that ''materially reduce'' MSD hazards in the job * * * OSHA recognizes that ''a number of MSD hazards are complex and it may not always be clear what control(s) will achieve a material reduction in the probability that MSDs will occur.'' * * * In an attempt to clarify what constitutes compliance with this requirement, OSHA then proposes that employers will be considered in compliance ''if they select and implement the controls that a reasonable person would anticipate would achieve a material reduction in the likelihood of injury.'' * * * However, the ''reasonable person'' standard is hardly a bright-line means of determining whether an OSHA inspector will find an employer in compliance.
>
> This is only one example of how compliance with the proposed standard, at best, is dependent on interpretations of vague standards by OSHA inspection officials—individuals, at least to date, with little or no training in ergonomics, who inevitably will establish differing criteria to be applied to employer efforts in this area. [Footnote omitted.] This approach invites litigation over the meaning of such vague terms. Indeed, the ''reasonable person'' is a long-standing standard of tort law used by juries to assess the culpability of an individual; by its nature, it is open to interpretation.
>
> Forum members fear that the vagaries of complying with the proposed standard may be held against them during the OSHA inspection process. By leaving too much to interpretation and failing to provide significant guidance, inspectors may be able to cite facilities despite their good faith efforts to comply. The lack of compliance guidance potentially is a fundamentally fatal flaw with OSHA's mandatory proposed standard and must be addressed by OSHA before a reasonable standard can be promulgated. [Ex. 30–3845]

The National Association of Manufacturers' post-hearing submission (Ex. 500–1) contained a letter from Scott Ward of Windings, Inc. Mr. Ward presented an analogy with how an existing performance standard is enforced. He described an example of how the existing standard on personal protective equipment has led to disagreements with OSHA's compliance staff and a citation:

> [W]e provided gloves and design changes to a material (woven fiberglass tape) to reduce an irritation—not even a hazard, for there is no injurious nature to the material—and re-assigned an employee who suffered the most irritation so as to not aggravate a skin condition. However, a field inspector cited us for lack of an effective program even though we had reviewed the material's MSDS, provided the recommended (not required) personal protection equipment, accommodated employee's complaints and the inspector's own testing indicated that the fiberglass dust was well below exposure level limits. We had begun work on ventilation equipment to provide extra equipment and this engineer, who doesn't have air fluid dynamics training, said it wouldn't work. The citation was reduced but it stood. [Ex. 500–1]

OSHA received comments and testimony that the training of its field staff would significantly affect the reasonableness of the Agency's compliance efforts (see, *e.g.*, Ex. 30–

1107; Tr. 5439, 7210). William Goldsmith, representing the U.S. Chamber of Commerce, was particularly concerned that the lack of training of OSHA field staff would lead to enforcement difficulties:

> And it also bears noting that the companies at least the ones that I am familiar with involved in these cases had ergonomics programs. Dayton Tire did. Hudson Foods did. So when one looks at the past history of what has happened with trying to enforce the terms and the concepts that are ripe throughout this proposed standard, you I think get a fair picture of what will happen if the proposed standard becomes a final rule.
>
> That is a compliance officer doing the best he or she can will come into a facility, will probably not be not very well trained through no fault of his own or indeed the agency's own, but because resources are limited, be making guesses as to what ergonomics stressors appear in what jobs and the litigation if that is what it is, if that is where results will begin. [Tr. 7210]

In their post-hearing submission, the Chamber noted that the American Society of Safety Engineers (at Tr. 11616) and the AFL–CIO (at Tr. 3498) agreed that training of OSHA's compliance staff would be crucial to the enforcement of the ergonomics standard (Ex. 500–188). The Chamber doubted, however, that such training would be successful:

> Thus, it is beyond dispute that additional training is required. Of course, it is difficult to understand how the Agency will successfully provide such training since * * * even the individuals who drafted the Proposed Rule do not know what it means. [Ex. 500–188]

Craig Brightup of the National Roofing Contractors' Association, which was concerned about the impact on small businesses, expressed similar concerns:

> OSHA's lack of enforcement restraint, coupled with the vagueness of the ergonomic standard, would be a disaster for small business. Chairman Talent stated in his comments, and I quote, ''Instead of developing a standard that gives small businesses guidance and assistance in implementing physical changes to the workplace that reduce and eliminate MSDs, OSHA has left it up to employers to figure out how to prevent or eliminate MSDs. These vast regulatory crevices into which small businesses will inevitably fall will be filled by the unfettered discretion of OSHA inspectors as they determine compliance. (Tr. 3330)

Edison Electric Institute noted the possibility that compliance officers would second guess employers' decisions on control measures (Ex. 32–300). The Center for Office Technology was similarly concerned that the ''subjective terms 'reasonable' and 'likelihood' make it impossible for either the employer or the OSHA inspector to know when an employer is in compliance [Ex. 30–2208].''

Some rulemaking participants went further, arguing that the vague language in the proposal forces employers to make subjective judgements about whether they have gone far enough to control hazards (see, *e.g.,* Exs. 30–3853, 30–3956, 32–337, 500–27; Tr. 6219). The Integrated Waste Services Association and the National Coalition on Ergonomics (citing *AFL–CIO* v. *OSHA,* 965 F.2d 962 (11th Cir. 1992) at 976) stated that this is in conflict with the requirements of section 6(b)(5) of the OSH Act for the Agency to set standards using objective criteria. The Coalition stated that the Agency cannot expect an employer to decide about permissible exposure to MSD hazards when OSHA is unwilling or unable to make that determination.

Mr. Edward C. Laux of the International Cemetery and Funeral Association believed that the term ''to the extent feasible'' was subjective and would present compliance difficulties for employers. Mr. Laux compared compliance under the proposal's requirement to control MSD hazards to the extent feasible with the reasonable accommodation test in Title I of the Americans with Disabilities Act:

> [Section 1910.921] provides that businesses must eliminate or materially reduce musculoskeletal disorder (MSD) hazards in the workplace ''to the extent feasible.'' This highly subjective standard presents difficulties of interpretation similar to the ''reasonable accommodation'' test in Title I of the Americans with Disabilities Act (ADA).
>
> The ADA ''reasonable accommodation'' test at 42 U.S.C. 102(b)(5) and at 1630.9 of the U.S. Equal Employment Commission regulations requires employers to make alterations in the workplace for disabled workers unless the accommodation would impose ''undue hardship'' on the covered business. Interpretation of the terms ''reasonable accommodation'' and ''undue hardship'' must be made on a case-by-ease and business-by-business basis. As a result, interpreting these ADA terms has been the subject of administrative appeals and expensive litigation of which small businesses, in particular, are ill-equipped to afford.
>
> The ICFA believes that the ''feasibility'' provision at 1910.921 of the proposed Ergonomics programs will result in similar conflicts of interpretation that cannot be resolved in a ''one size fits all'' application. Small businesses, which comprise 87 percent of the cemeteries and funeral homes in the United States, will be confronted by OSHA inspectors second-guessing their understanding of this vague provision and imposing fines on these businesses where they disagree with their judgment.
>
> At that point, small businesses will be forced to choose between two highly unattractive alternatives: either to pay expensive penalties for noncompliance with a vague and subjective standard or to hire expensive lawyers to appeal and litigate the fines. The litigious history of similar language in the ADA removes any doubt that this scenario as applied to the Ergonomics standard is not only probable but certain. [Ex. 500–27]

b. Comments that the vagueness of the rule is compounded by the lack of scientific certainty. Some rulemaking participants argued that the lack of guidance was compounded by the scientific uncertainty of whether a given control measure would abate the hazards (see, *e.g.,* Exs. 30–294, 30–461, 30–494, 30–1722, 30–2986, 30–3853, 32–337, 500–197; Tr. 3232, 11375). For example, the U.S. Chamber of Commerce stated, ''At first glance, the 'reasonableness' element of these definitions seems to provide an employer a certain amount of leeway in eliminating or reducing the hazards. This, however, is not the case. Under current scientific principles, nobody knows the point at which the likelihood of an MSD occurring will be reduced.'' The Chamber alleged that OSHA's experts admitted as much. The Chamber quoted small portions of two OSHA expert witnesses in *Secretary of Labor* v. *Hudson Foods* and *Secretary of Labor* v. *Dayton Tire* to support this point. The Chamber suggested that the witnesses could not quantify the reduction in the rate of MSDs resulting from a given control measure. The Chamber concluded:

> These statements were made, it bears repeating, by people called by OSHA in litigated matters to support particular ergonomics allegations individuals whom, presumably, OSHA believed qualified enough to sponsor as experts at trial. Yet neither of them could support the efficacy of their particular recommended abatements in a particular workplace cited for particular violations of the General Duty Clause. Nevertheless, somehow OSHA expects employers * * * even small employers like the overwhelming majority of the Chamber's members * * * to develop their own effective control measures.
>
> Although OSHA has shifted to the employer the burden to identify to what degree a ''risk factor'' must be reduced to prevent an MSD from occurring, that is a question nobody can answer. Indeed, OSHA concedes that ''[b]ecause of the multifactoral nature of MSD hazards it is not always clear whether the selected controls will achieve the intended reduction in exposure to MSD hazards.'' 64 Fed. Reg. at 65827. Furthermore, in some cases, particular ergonomic controls may cause more harm than good. 64 Fed. Reg. 65827 ''[m]any employers evaluate controls within 30 to 60 days after implementation. This gives employees enough time to get accustomed to the controls and to see whether the controls

have introduced other problems into the job.'' (emphasis added). Because no one, including OSHA, is equipped to identify at what point an MSD is less likely to occur or to identify which abatement measures are effective in reducing such likelihood, this requirement is flawed beyond repair. [Ex. 30–1722]

The National Coalition on Ergonomics (Ex. 500–197) echoed the Chamber's point and argued that the rulemaking record demonstrated a lack of consensus regarding what control measures would be effective in reducing the rate of MSDs:

Ergonomics experts likewise admit the impossibility of predicting with any degree of accuracy the ergonomic modifications that will successfully reduce musculoskeletal complaints. [Footnote omitted.] In fact an expert testifying for OSHA in a general duty clause enforcement action said he would need a ''crystal ball'' to determine whether a particular abatement measure would eliminate ergonomic stressors.[10] [Footnote: Transcript, April 6, 2000, at 7191–92. In March of 1999, an expert ergonomist hired by OSHA in another matter confessed that there is simply no way to predict in advance the outcome of a particular abatement measure. He testified that it is impossible for an employer to know ahead of time whether a control measure will materially reduce or even reduce at all the rate of musculoskeletal complaints. Transcript, April 6, 2000, at 7194.] The lack of consensus regarding appropriate ergonomic interventions among the people who ultimately would be relied on to implement the proposed rule surfaced repeatedly in the hearings. The hearings also revealed the highly uneven track record of ergonomic interventions in the workplace and the consistent inability of ergonomics professionals to measure the effects of ergonomic interventions, or to predict when a particular intervention will be effective in controlling or abating targeted musculoskeletal complaints. [Ex. 500–197]

The Coalition further contended that no consensus exists as to who is best situated to identify effective ergonomic solutions (Ex. 500–197). The Coalition noted that some ergonomics professionals testified that employees are the best persons to identify controls but that others, including one of OSHA's expert witnesses, occupational health professionals, and employees themselves, stated that employees did not have the expertise necessary to identify control measures. NCE concluded this argument by stating: ''OSHA has put the cart before the horse in promulgating a rule that requires employers to produce solutions that reduce ergonomic hazards when no available or reliable means exist for predicting or measuring the efficacy of ergonomic interventions.''

LPA, Inc., also objected to the proposed control endpoints because ergonomics is not an exact science (Ex. 30–494). LPA noted that the studies on which NIOSH and OSHA relied did not provide sufficient information to employers so that they could evaluate jobs, assess exposure to risk factors, and select controls that will eliminate the risk factors.

The Honorable David McIntosh, Chairman of the House Subcommittee on National Economic Growth, Natural Resources, and Regulatory Affairs, noted that even OSHA admits that most ergonomic fixes are not 100 percent effective (Ex. 30–542, 30–3010). He wrote:

A second problem is the lack of end points or clear criteria for determining when an employer has fulfilled his obligations. OSHA is an enthusiastic proponent of ergonomic ''solutions.'' But even OSHA admits that most ergonomic fixes are not 100 percent effective. [Footnote omitted.] For example, in shoe manufacturing, installing armrests and footrests, elevation and tilt equipment, better designed chairs, and pallet levelers to minimize bending while lifting reduced the ''number of damaging wrist motions in assembly jobs by one-third,'' reduced ''disc compression forces in clerical jobs by about 17 percent,'' and reduced ''disc compression forces during lifting jobs by more than 50 percent.'' [Footnote omitted.] Such workstation modifications undoubtedly reduce the risk of MSDs. But, suppose another MSD occurs after the employer has implemented those changes. What is the employer's obligation? Must he experiment with more engineering options? Must he slow the pace of work, or implement a job rotation system? [Footnote: ''The answer appears to be 'yes.' Here is the regulatory language: '[Y]ou must continue this incremental abatement process if other feasible controls are available' (1910.922(c)).''] How practical would that be in a small establishment? What if the only way to eliminate damaging wrist motions and disc compression forces is to eliminate the jobs that require wrist flexion and bending while lifting?

An employer can only guess when his efforts to reduce MSDs are adequate in OSHA's eyes, because the rule contains no outcome performance measures or benchmarks. Reducing MSDs by 50 percent or even 70 percent below current levels is no guarantee that an employer has done enough. Nor is it clear that reducing MSDs 50–70 percent below national average rates for particular kinds of jobs assures compliance with the rule. As long as MSDs occur, an employer remains vulnerable to legal challenge by his employees and OSHA. Yet eliminating all MSDs is beyond any employer's technical and financial resources. To say nothing of the fact that ergonomic ''science'' is still in its infancy, many MSDs are caused or aggravated by activities—sports, yard work, a second job—that may be completely outside an employer's control. The proposed rule thus gives OSHA an open-ended pretext to inspect, cite, and prosecute American companies. [Ex. 30–542]

Mayville Engineering Company, Inc.(Ex. 30–294) noted that it had difficulty applying controls to abate ergonomic hazards without having MSD symptoms surface in previously unaffected employees:

We had a facility that had 10 identical workstations that assembled radiator cores. We had 3 individuals, within a month, report MSDs. The three individuals had worked at these workstations less [than] 1 year. One of the individuals had only been doing this job 6 months. The other individuals working at the other 7 workstations had been working on these jobs from 3–10 years each and had not reported any MSD symptoms. During the hazard evaluation we questioned the 7 as to any problems they had with the workstations and they felt that the workstations were fine the way they were.

We made modifications to all 10 of the workstations based on the MSDs reported. The other 7 individuals started to report MSD symptoms with in 3 weeks. How would this be addressed in your Proposed Standard? [Ex. 30–294]

The National Coalition on Ergonomics noted that the hearing transcript included evidence of other similar instances that the Coalition claimed showed that ergonomic interventions were either ineffectual or created more problems than they solved (Ex. 500–197). On this point, NCE cited the experience of an office that handles 9–1–1 calls, a municipal solid waste department, the Social Security Administration, the Communications Workers of America, and Levi Strauss and Company. The Coalition also cited a passage from Dr. Emil Pascarelli's book, *Repetitive Strain Injury: A Computer User's Guide:* ''All the ergonomic equipment in the world won't prevent RSI unless people who use computer keyboards learn how to type safely, pace themselves, and care for their upper bodies.''

Ms. Lisa Brooks, testifying on behalf of International Paper Company, stated that the current science of ergonomics did not support interpreting the proposed standard consistently for a particular job or task (Tr. 11375). She

[10] The full text of the transcript cited in the Coalition's footnote reads as follows:

''With respect to all of your proposed abatements, proposed possible solutions, as you call them, that if every single one were implemented with respect to every single job, there would still be ergonomic stressors in every single job?''

Answer, ''I don't know if there still would be ergonomic stressors in every single job, but there might be ergonomic stressors in some jobs, but I can't say that there still would be ergonomic stressors in every single job. No, sir, I cannot say that.''

What would it take for you to say one way or another whether that would be so?''

Answer, ''A crystal ball.''

It is clear from this exchange that the witness was talking about more than one control measure being applied to more than one job.

noted specifically that two lifting guides, Liberty Mutual's manual handling tables and the 1991 NIOSH lifting equation, provide different levels of acceptable risk. She was concerned that, if an employee's condition did not improve after applying the more liberal of the two guides, OSHA would force an employer to use the more conservative even though both are nationally recognized. Ms. Brooks argued that the language in the proposal left the employer in doubt:

> Would the determination of the compliance end point change if the injured employee's condition did not improve?
>
> The answer to this question depends upon the interpretation of reasonably likely to occur and significantly reduce the likelihood for a particular job or task.
>
> Some could argue that since the injured employee's condition did not improve, the facility only materially reduced the musculoskeletal disorder hazards at the facility and that the facility must continue in the incremental abatement process and implement additional feasible controls.
>
> Once in the incremental abatement process, the compliance end point becomes tied to the recuperation of an individual. [Tr. 11377]

Ms. Brooks concluded by urging OSHA to postpone the promulgation of the ergonomics standard until it could be written so that compliance can be consistently and objectively measured (Tr. 11381).

c. *Comments that OSHA has not provided sufficient guidance for employers to comply with the proposed standard's compliance endpoint.* Many rulemaking participants were concerned that the proposed standard and the preamble discussion of the regulatory text provided little hazard control guidance for employers (Ex 30–1536, 30–1722, 30–3813, 30–3845, 30–3956, 30–4185, 32–300, 35–106, 500–197). Some were concerned that employers, particularly small ones, would not have the resources to implement the requirements in the proposed standard or to make the judgments it calls for (see, *e.g.,* Exs. 30–1536, 30–2834, 30–3077, 30–3348, 30–3751; Tr. 3330, 8226). These commenters argued that this would force many employers to hire an expert.

Some rulemaking participants believed that OSHA should provide additional guidance for the terms and concepts used in this part of the standard (see, *e.g.,* Exs. 30–1557, 30–2987, 30–3748, 30–3765, 32–133, 32–300). For example, ORC and Edison Electric Institute urged OSHA to include a nonmandatory appendix listing risk factors and examples of acceptable controls (Ex. 32–300). The American Association of Occupational Health Nurses urged OSHA to provide clarification for situations in which MSDs are still being reported after all feasible controls have been implemented (Ex. 30–2387). Dow Chemical Company suggested that the Agency could put appendix-like material on its Web site (Ex. 30–3765). Dow also asked for guidance on the type and amount of improvement that was expected under the incremental abatement process and on the amount of time that was allowed to pass between incremental abatement measures. The American Health Care Association recommended defining ''feasible'' and better explaining the term ''materially reduce'' (Ex. 30–2987). At the hearing, Frank White described ORC's position as follows:

> How do I know when I've achieved compliance? Now I understand that OSHA struggles with this issue, but the proposed sections 921 and 922 we believe are off the mark.
>
> In ORC's opinion, the difficulty of establishing precise exposure response relationships between the particular health effects being regulated and a specific workplace risk factors that allegedly cause those condition does not relieve OSHA of the [basic] obligation to provide some quantitative guidance to employers on a point at which significant risk is substantially reduced.
>
> Only in this way will an employer be able to determine whether taking action to control particular workplace risk factors is likely to materially reduce the risk of the specific musculoskeletal disorder that has occurred. [Tr. 4109]

The American Industrial Hygiene Association (AIHA) supported the proposed standard's performance-based compliance endpoint (Ex. 32–133). However, AIHA also believed that OSHA should provide additional guidance. The Association stated:

> AIHA supports the fundamental performance-related elements of the proposed ergonomics standard.
>
> The requirement to eliminate or materially reduce ergonomic problems to the extent feasible is a valid performance criterion. Similarly, the ''incremental abatement process'' is performance-based and recognizes the complex nature of ergonomic problems.
>
> Whether a risk-based approach is considered or not, OSHA should add some appropriate examples of risk assessments so that employers can utilize appropriate guidelines and have an idea of what compliance officers will be looking for. OSHA should recommend a variety of risk assessment approaches and describe how enforcement of the standard will take place. [Ex. 32–133]

The Employment Policy Foundation suggested that OSHA include a detailed table to serve as a guide to compliance and to facilitate verification of the Agency's cost estimates (Ex. 30–1557). The Foundation argued that each of the major compliance elements involves several subsidiary compliance tasks. The Employment Policy Foundation provided a table of the tasks that it believed the standard required and recommended that OSHA include one like it in the final rule. The Foundation's table included not only compliance endpoint-related tasks, but tasks related to all aspects of the standard.

d. *OSHA's response to these comments.* In response to the many commenters arguing that the proposed compliance endpoints were too vague and failed to give adequate notice to employers, would lead to uneven enforcement, OSHA has added objective compliance endpoints to the final rule. The three acceptable endpoints are: (1) Control of MSD hazards, (2) reducing MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D that the employer used to conduct the job hazard analysis, and (3) controlling hazards to the extent feasible. The Agency has explained each of these options above.

The second compliance endpoint, reducing MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D, provides objective criteria to help employers attain an endpoint. In Appendix D–2, OSHA is providing a chart outlining reasonably objective measures of acceptable levels of ergonomic risk factors for VDT operations. In Appendix D–1, OSHA is referencing existing tools that employers are currently using to identify and control ergonomic risk factors. OSHA believes that these tools will provide employers with a bright line method against which they can judge whether their compliance efforts meet the final standard's compliance endpoint.

The employer also has the option ''to reduce MSD hazards to the extent that they are no longer reasonably likely to cause MSDs that result in work restrictions or medical treatment beyond first aid.'' OSHA is providing sufficient guidance, in the preamble, appendices to the standard, and compliance assistance materials, to help employers understand and follow this compliance endpoint. The employer will have to use some judgment and will need to be knowledgeable about the relationship between risk factors and the different types of MSDs when using this endpoint. Many rulemaking participants presented examples of measures they have used to adequately control

ergonomics hazards (see, *e.g.,* Exs. 32–274, 500–6, 500–12, 500–50; Tr. 8557, 8579, 11533, 12564, 14972). They clearly understood what needed to be done to control the hazards and where to find the tools to accomplish that goal.

The extensive scientific basis for OSHA's standard is discussed in the Health Effects and Risk Assessment sections of this preamble. However, it is not necessary for an employer to have a complete grasp of ergonomics science in order to comply with the final rule. Many witnesses testified that they had little or no difficulty in addressing jobs successfully (See, *e.g.,* Ex. 32–274; Tr. 11532, 12461, 14708, 14836, 15046), and OSHA has given employers extensive flexibility in addressing these hazards, together with many tools and models to use. In addition, many problems and solutions are readily apparent after observing a job and talking with employee. The availability of professionally-developed tools and the compliance assistance tools being provided by the Agency will also help employers select appropriate control measures to reduce MSD risk factors sufficiently. These risk reductions will lead to a corresponding reduction in the incidence and severity of MSDs at the workplace.

With respect to Mayville Engineering Company's and the National Coalition on Ergonomics' comments that efforts to control MSD may create other MSD hazards and lead to more injuries, OSHA notes that it is possible for certain interventions to increase some risk factors at the expense of the ones an employer is trying to control. However, it does not automatically—or normally—follow that decreasing the duration, frequency, or magnitude of one risk factor will increase another. If that were the case, ergonomic intervention studies, such as those depicted in the Risk Assessment section of the preamble, would be very infrequent, rather than the norm for those employers making a good faith effort at addressing these hazards. It should also be noted that in one of the cases cited by the Coalition, the employer saw an overall decrease in the number of MSDs from the control measures, and further measures were taken to lower the risk factors causing the new MSDs (Tr. 17822 [11]). In another case, a company representative testified that the company ''put in place a wide variety of effective controls'' (Tr. 14706).

Thus, OSHA has concluded that the final rule's endpoint is scientifically sound and will help reduce the number and severity of MSDs in the workplace.

OSHA agrees with commenters, like the National Coalition on Ergonomics, the AFL–CIO, and the American Society of Safety Engineers (Tr. 3498, 7210, 11616), who stated that enforcement of the final ergonomics standard will necessitate extensive training of the Agency's compliance staff. OSHA compliance officers will need to be educated in the requirements of the standard, signs and symptoms of MSDs, ergonomic risk factors, and appropriate control measures, among other things, so that the Agency can enforce the standard in a uniform and reasonable manner. Such training, based on the final standard and on the compliance guidelines contained in this preamble and the appendices to the final rule, is currently being developed and will be provided before the compliance deadlines in the standard.

2. Comments on Whether the Proposed Compliance Endpoint Would Illegally Delegate Rulemaking Responsibility

a. *Comments that the proposed rule would shift the burden of determining the compliance endpoint to employers.* Some rulemaking participants objected that the vagueness inherent in the proposed language shifted much of the burden placed by the OSH Act on OSHA to employers (see, *e.g.,* Exs. 30–1722; 30–3956, 35–106; Tr. 4110, 15648–15649). The U.S. Chamber of Commerce argued that the proposal left to employers the determination of the safe exposure level and the appropriate controls (Ex. 30–1722). Even though it recognized that the proposed standard properly allowed the employer flexibility, the Chamber stated that the proposal went too far:

> Under the Proposed Rule, it is up to the employer to do the Secretary's job of setting a standard that ''most adequately assures, to the extent feasible, * * * that no employee will suffer material impairment of health or functional capacity,'' 29 U.S.C. § 655(b)(5), from exposure to perceived ergonomic hazards. It is the employer that must determine when an employee is at risk from hazards that are ''reasonably likely to cause or contribute to MSD[s].'' Proposed §§ 1910.917, 1910.944, 64 Fed. Reg. at 65832. 65864. And it is up to the employer to determine any combination'' controls either to eliminate the hazards or to at least reduce them ''to the extent feasible.'' Proposed §§ 1910.917, 1910.920(a), 64 Fed. Reg. at 65803, 65828. While the Preamble contends that [t]here are many qualitative and quantitative ways to determine the magnitude of exposure,'' * * * the Proposed Rule fails to set objective levels at which an employer would be required to act. Moreover, the Proposed Rule fails to identify specific measures that an employer must implement to control these supposed hazards. The Act requires the Secretary to make these decisions * * * which the Secretary concedes are impossible to make * * * and not simply to foist that obligation on the regulated community under threat of considerable civil penalties and compliance costs. [Ex. 30–1722]

The National Coalition on Ergonomics made a similar point:

> The proposed standard is so vague and ambiguous that arguably, through its adoption, OSHA will have shifted the burden of identifying the hazard (which is clearly OSHA's duty) and the appropriate response to the hazard (which is also clearly OSHA's duty) to employers. At the same time, the proposed standard fails to clearly state or place meaningful boundaries on what may be required by enforcement personnel to such [a] degree that, if adopted, the standard would represent an unconstitutional delegation of authority from Congress to OSHA. [Ex. 30–3956]

OSHA believes that the final standard is sufficiently clear to inform employers of their obligations, and therefore does not place impossible burdens on employers. The final rule gives employers options. Employers may, but are not required, to use the objective criteria in Appendix D to determine the hazard control level. The rule also gives employers the flexibility to use alternate performance-based measures.

b. *Comments that the proposed rule would shift the burden of determining feasibility and compliance endpoints to OSHA compliance staff.* The American Iron and Steel Institute (AISI) stated that the proposed standard improperly delegated rulemaking authority to OSHA's compliance staff (Ex. 500–223). AISI contended that the proposed rule was equivalent to requiring each employer to issue an unlimited number of blank checks for ergonomic control measures and allow OSHA to fill in the amounts. The Institute argued: ''The mere possibility that the proposed standard is written in such a way as to permit OSHA to adopt * * * an unreasonable and impermissible

[11] With respect to the initial ergonomic interventions taken at the 9–1–1 center, Mr. James August of the American Federation of State, County and Municipal Employees testified: ''This intervention drastically reduced the injuries. It did not create more injuries * * *. [F]rom the entire work force of very high injury rates, virtually all of the carpal tunnel and wrist injuries were eliminated.'' (Tr. 17822)

With respect to the follow-up on the few new MSDs that developed, Mr. August stated:

> [T]here were a couple of employees where there were some shoulder problems that started to surface early on when the intervention was made * * *. But the same analysis that was done to identify the original problem was used to quickly remedy the resulting problem from the intervention.
>
> So it was not a matter of having to junk the whole system that was put in and start from scratch. This was a refinement which is what all of us involved in the field of ergonomics do on a continuous basis. [Tr. 17823]

enforcement strategy, contrary to applicable Constitutional and statutory requirements, leads to the unavoidable conclusion that the proposed standard is fatally defective and should be withdrawn. [Ex. 500–223]''

As noted in the discussion of the previous issue, OSHA has given employers sufficient guidance so that they can determine, before an inspection occurs, whether or not they are in compliance with the rule. In fact, if an employer reduces MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D (or the more stringent Basic Screening Tool), there is no doubt that an employer is complying with the final rule's compliance endpoint. OSHA compliance staff will therefore have no difficulty determining whether an employer is complying with Appendix D. The remaining endpoints, controlling MSD hazards and feasibility, give added flexibility to those employers who believe that they can control MSD hazards by means other than the endpoints in Appendix D or who cannot feasibly reach those levels. Consequently, the final rule does not improperly delegate rulemaking authority to OSHA compliance staff.

3. Comments on Whether the Proposed Compliance Endpoint Would Force Employers To Go Too Far in Controlling MSD Hazards

a. *Comments that the proposed standard would force employers into a never-ending circle of hazard control improvements.* Some rulemaking participants were concerned that employers would face a never-ending circle of hazard control improvements (see, *e.g.,* Exs. 30–1722, 30–3956; Tr. 3171). For example, the National Coalition on Ergonomics stated that as long as ergonomic complaints [12] continued, employers would need to go further and further in the incremental abatement process (Ex. 30–3956). In addition, the Coalition asserted that, except where the employer can show the problem is unique to an individual employee, the employer would be obligated to implement corrective action not only for the complaining employee but for every employee doing the same job or another job involving the same or similar work activities. The Forum for a Responsible Ergonomics Standard went further, arguing that this portion of the standard was infeasible:

> OSHA's proposal is infeasible, however, because it requires an undefined ''material reduction'' in MSDs, despite the fact that no technology, work practice, or other type of control exists that will ensure such reductions. Any mandatory standard must take into account the fact that numerous controls may be available and, perhaps, effective to some degree, but that they cannot ensure any rate of success in reducing MSD injuries or hazard factors. Employers simply will not be able to guarantee compliance with the standard, no matter what efforts they make to adhere to OSHA's proposed program. [Ex. 30–3845]

The American Iron and Steel Institute argued that the standard would necessitate more and more controls as employees deconditioned by an increasingly sedentary workplace would have less capacity to tolerate demanding physical activity (Ex. 30–3951, 32–206).

Under questioning at the hearing, Mr. Thomas Durbin of PPG Industries was concerned that an employer following the incremental abatement process would need to continue to apply control measures even after all workplace ergonomic stress factors were eliminated as long as MSDs continue to occur (Tr. 3171).

These comments are based on the false premise that an employer would not be finished applying ergonomic control measures until all MSDs disappear from the workplace. OSHA has drafted the final ergonomics standard to make it clear that this is not the case. The goal of the final rule is the reduction in workplace MSD hazards, that is the reduction in the frequency, magnitude, or duration of the risk factors causing MSDs in problem jobs. When an employer controls these risk factors to a level meeting one of the compliance endpoints given in paragraphs (k)(1)(i) through (k)(1)(iii), the employer does not have to institute further controls even if MSDs continue to occur. Consequently, OSHA has concluded that the final compliance endpoints will not force employers into a never-ending circle of hazard control improvements.

b. *Comments that the proposed standard forces employers to experiment with control measures until they find one that works.* Some rulemaking participants objected that the incremental abatement process would require employers to experiment with hazard control technologies of uncertain efficacy until the employer cannot afford to implement additional controls (see, *e.g.,* Exs. 30–296, 30–402, 30–1722, 30–2134, 30–4185; Tr. 4906, 5645). For example, the Chamber (Ex. 30–1722) argued that OSHA has left to employers what the Agency cannot do itself, that is, determine what controls will reduce significant risk to employees:

> In sum, it is plain that the Agency is unable to make the difficult policy choices that Section 6(b)(5) places squarely in its hands, and that instead OSHA has chosen to defer these choices to the regulated community. The only justification that the Agency proffers for this flawed approach is that OSHA simply cannot determine broad standards that would be appropriate for the wide variety of covered industries and jobs. However, OSHA has fared no better in assessing causation and appropriate abatement when dealing with individual workplaces and specific jobs in enforcement proceedings. Thus, as noted above, OSHA has lost on one or both of those grounds in every ergonomics case it has litigated on the merits * * *. If, as these cases show, OSHA cannot determine what causes musculoskeletal complaints in a particular job-and how to abate them properly, there is no reason to think that employers will fare any better. [Ex. 30–1722]

The National Coalition on Ergonomics detailed this argument in their post-hearing submission (Ex. 500–197). The Coalition contended that ergonomics professionals are unable to articulate effective solutions to ergonomic problems in other than vague generalities, leaving employers little choice but to engage in trial and error experimentation. Because its review of the hearing transcript could not identify a single witness who was able to identify a particular ergonomic intervention that is sufficient to satisfy the rule, the Coalition questioned how well employers would be able to choose controls that would bring them into compliance.

In its post-hearing submission, Federal Express (FedEx) gave an example purporting to show how the company would be forced into experiments to try to reduce ergonomic risk factors further (Ex. 32–208). Federal Express noted that the existing workspace for package handlers is optimized so that a single employee reaches as short a distance as possible given the design of the conveyors, trucks, and other equipment. FedEx indicated that redesigning the space to accommodate a second employee would actually increase the distance packages are handled. The company argued that trading one risk factor for another, as such a redesign would cause, would have an unpredictable effect on the number of MSDs for that job.

On the other hand, Mr. Sittichoke Huckuntod, testifying on behalf of Levi Strauss and Company, acknowledged that industrial safety design is a system of trial and error by its very nature (Tr. 14747). The Forum for a Responsible Ergonomics Standard noted that addressing MSD hazards is an iterative process, often requiring significant trial

[12] As noted elsewhere in this preamble, the Coalition has mischaracterized the proposal's use of the term ''covered MSD'' as ''complaints.''

and error before improvements are realized (Ex. 30–3845).

OSHA acknowledges that fully solving ergonomics problems is not always straightforward. Some employers who have little or no expertise in ergonomics will indeed need to undergo some trial and error in their hazard control efforts. As noted by Ms. Sharon Murray, the former director of Rochester Office of Emergency Communications (a 9–1–1 call center), employees might not use new equipment intended to reduce risk factors in the manner anticipated by the employer (Tr. 17819). For example, when an employer institutes a control measure designed to reduce awkward wrist postures, it might increase long reaches for some employees. In Ms. Murray's case, the unanticipated hazard was a relatively simple problem to resolve (Tr. 17823).

The Agency does not believe that this trial and error is unique to ergonomic hazards. As Mr. Huckuntod acknowledged, industrial safety design is a system of trial and error by its very nature (Tr. 14747). A new ventilation system, for example, might not work as it is designed to, and the employer might have to modify it after its initial installation.

OSHA has removed the proposal's incremental abatement option and believes that employers will be able to meet the final rule's compliance endpoints with a minimum of experimentation. As the AFL–CIO (Ex. 500–218) noted, ''Several experts, including David Alexander (Tr. 2518, 2716), David Caple (Tr. 2716), and Dennis Mitchell (Tr. 2530), testified that in 80–85 percent of cases, ergonomic problems can be solved with one intervention.'' With the compliance assistance tools provided by the Agency, even small employers should be able to reduce MSD risk factors to acceptable levels with a minimum of experimentation. For these reasons, OSHA concludes that the final rule will not lead to undue experimentation by employers.

c. *Comments that the proposed standard places no limit on how far an employer must go in controlling MSD hazards.* Some rulemaking participants objected to any compliance endpoint that required an employer to eliminate MSD hazards from the workplace because such an endpoint places no limits on how far an employer must go in controlling MSD hazards (see, *e.g.,* Exs. 30–2208, 30–3765, 30–3956, 30–4185). For example, Dow Chemical Company noted that there is no such thing as zero risk and that this approach was inconsistent with OSHA's standards on toxic chemicals, which set exposure levels that entail some residual risk to employees (Ex. 30–3765). The National Coalition on Ergonomics also argued that the open-ended requirement to use all feasible control methods until the risk of an MSD reaches zero conflicts with well-established case law to the contrary (Ex. 30–3956). The Center for Office Technology also believed that OSHA is obligated to set a threshold above zero risk (Ex. 30–2208). Patrick Tyson of Constangy, Brooks and Smith asserted that the proposed rule, in essence, defined an MSD hazard as the existence of even one MSD in a 3-year period (Ex. 30–4185). Mr. Tyson contended that a rate of one OSHA recordable MSD every 3 years does not constitute a significant risk.

Some rulemaking participants were concerned that the standard placed no limits on the controls that an employer would be forced to implement (see, *e.g.,* Exs. 30–494, 30–2208, 30–3765, 32–211, 32–234; Tr. 10429, 10950). For example, Dow Chemical Company questioned the extent to which employers would need to go to avoid citations (Ex. 30–3765). Dow believed that the proposal would require employers to adopt the latest technology regardless of cost or how great the reduction in hazards. Mr. Gregory Watchman of Paul, Hastings, Janofsky and Walker stated that, if MSD signs and symptoms continue to occur, even on a sporadic basis, the employer would be forced to implement additional abatement measures indefinitely (Ex. 32–211). Mr. Watchman reasoned that the duty to implement additional controls would be triggered very frequently in most workplaces because of the frequency with which workers experience short-term discomfort, aches, and pains.

Mr. George Page, the owner of a small industrial engineering and ergonomics consulting firm, provided an example of why he thought the proposal's compliance endpoints went too far (Tr. 10429). He testified about a client who had instituted a variety of ergonomic initiatives with good results. Mr. Page was not sure whether the employer would be in compliance with the proposed rule.

The American Dental Association provided a theoretical example of how far the Association would have to go to control MSD hazards at their headquarters:

> The ADA headquarters is located in a building that was built more than 35 years ago. The work areas were designed and furnished before the proliferation of modem computing activities. It would not be cost-effective, or in some cases even possible, to retrofit them to satisfy the proposed standard. Thus, the ADA could be required to substantially rebuild or replace affected work areas, furnishings and equipment in order to comply. It is difficult at this point to determine the full scope of the ADA's compliance burden, because the proposed standard would require the ADA to continue to implement incremental changes to its work environment until it substantially reduced or eliminated the incidence of covered MSDs. Because 50% of the ADA's workforce is engaged in the same or similar work activities, the Association would be required to implement these changes for 200 employees simultaneously, even though only one employee reported a problem.
>
> The ADA has made—and will continue to make—adjustments to keyboards, monitors and other peripheral aspects of its work environment, but for reasons of providing a more comfortable and efficient workplace for its employees, not because of some highly speculative benefit. However, there is no assurance that these simple measures would be sufficient to achieve compliance under the standard's incremental approach to compliance. [Ex. 32–141]

Federal Express argued that, because of the unique nature of its facilities, the company would see no appreciable effect from incremental changes to its workstations (Ex. 32–208). Federal Express further argued that only a complete redesign would accomplish anything more than negligible improvements in the number of workplace MSDs:

> While the proposed ergonomics standard provides for incremental changes to the work environment until ''covered MSD'' are significantly reduced, [footnote omitted] the unique nature of the facilities at and the corporate experience of FedEx is such that incremental changes would have no appreciable effect upon * * * reducing ''covered MSD,'' and only a quantum change involving complete redesign and reconstruction of facilities may potentially yield measurable results. Even then, it is not clear that the changes in outcome in which OSHA is interested is the result of these changes. The reason for the nebulous impact of incremental change is two-fold. First, the nature of the physical facilities which FedEx operates is such that space limitations do not allow further design alterations, added equipment, or additional, extraneous staffing. Second, FedEx's facilities, operational process and equipment have all been designed and employed with the application of ergonomic principles for the purpose of improving productivity. As a result, incremental changes to the workplace in the context of FedEx's facilities, which are already at or near the frontier of automation and technical feasibility will fail to have an appreciable impact upon the reduction rate of ''covered MSD.''
>
> * * * * *
>
> To be sure, some incremental changes can be made. FedEx does not assert an ''all or nothing'' position, wherein absolutely no space whatsoever remains for incremental changes to be made in the existing facilities.

Rather, FedEx asserts that, to effect a material reduction in work-related ''covered MSD,'' the changes required would be quantum in nature, so as to necessitate an entirely new facility. The space limitation upon the existing facility will admit of some, very limited incremental changes, but those changes would be so limited by space, so ephemeral in nature, as to be ineffective in reducing ''covered MSD.''

For example, the design for the existing facilities, while tailored to the number of employees required to complete a task, is not precise to the person with regard to every position in the sort facility or even in the trucks or customer service stations. Rather, one additional person can, conceivably, be added to the workforce in some capacity in some facilities, in a manner where he or she will not detract from the efficiency of FedEx's operations. FedEx maintains, however, that the increase of one additional individual is not an administrative or work practice control which will render a material reduction of any hazard at all. In fact, the effect will not be noticeable, except on reduced efficiency. Once the workplace is increased significantly beyond one additional person, however, the facilities's space limitations operate to reduce both operational efficiency and workplace safety. [Ex. 32–208]

Patrick Tyson of Constangy, Brooks and Smith objected to the extent to which the proposed endpoint would require employers to go to reduce ergonomic hazards (Ex. 30–4185). He stated:

Having stated our objections, not to the need to implement engineering controls, but to the point at which such controls must be implemented, we also submit that contrary to OSHA's assertion in the Preamble that the proposed Standard establishes ''control endpoints'' which define when an employer is in compliance, there are two inter-related problems with § 1910.921. First, for any manufacturing jobs in which employees perform repetitive motion tasks for a significant part of the work day, as a practical matter, an employer's legal duty will never be satisfied until employees are no longer performing the manual tasks. We question whether the Agency should promulgate a Standard with this result, even if unintended. Secondly, although § 1910.921 is apparently intended to state that employers can be in compliance short of automating the job functions, we believe that there is no objective measure of compliance short of either automating the job task or function or eliminating it. [Ex. 30–4185]

He contrasted this with the expectation of OSHA enforcement staff that employers, under their existing general duty clause obligations, must institute controls that lead to a reduction in the seriousness of MSDs, not in their numbers. He also contrasted the standard's requirements with the experience of one of his firm's clients, who had instituted an ergonomics program and had 6-years' experience with it. This employer had spent over $19.5 million in capital improvements to reduce lifting hazards in six facilities and reduced the number of recordable MSD cases, including back cases, by less than 50 percent over the last 5 years of the program (through 1999). Mr. Tyson was particularly concerned that the standard would require this employer to institute further controls.

Here again, these comments are based on the false premise that an employer would not be finished applying ergonomic control measures until all MSDs disappear from the workplace. The final rule's compliance endpoints do not require employers to go that far in controlling MSD hazards. In fact, all the compliance endpoints in the final rule contain discrete stopping points that allow an employer to stop even if MSDs continue to occur. One of the endpoints, reducing MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D, provides objective measures against which an employer can determine whether it has fulfilled its compliance obligations. When the employer reduces the risk factors below those levels, he or she is finished instituting control measures. The control of MSD hazards endpoint, although not as specific, also allows an employer to stop even if MSDs continue to occur. That endpoint, paragraph (k)(l)(i), requires reducing the hazard to the level where MSDs resulting in work restrictions or medical treatment are reasonably unlikely, not to the level of absolute safety or no MSDs. The endpoint will not require employers to seek to eliminate all aches and pains or symptoms of discomfort, as feared by Mr. Watchman. The required hazard reduction is directed at MSDs that require work restriction or medical treatment. The last endpoint is reducing MSD hazards to the extent feasible. When the employer has reached the limits of feasibility, he or she is in compliance regardless of whether MSDs are continuing to occur, at least until additional controls become feasible.

d. *Comments that requiring employers to go to the limits of feasibility is unreasonable.* Some rulemaking participants were concerned that the proposed requirement to control hazards to the extent feasible would require employers to continually review ergonomic research for the latest in control technology (see, *e.g.,* Exs. 30–2208, 30–2987, 30–4607, 32–234). For example, the Center for Office Technology argued that this requirement would be very costly as employers would be forced to replace office furniture every time a new desk is offered for sale. Concerned that employers would be forced to conduct constant reviews of new technology, the American Health Care Association recommended that OSHA provide technology and program upgrade information (Ex. 30–2987). The Association believed that the Agency was in a better position to determine when new and credible research made new control measures available. Caterpillar, Inc., stated that once ergonomic complaints cease there would be no need to review new technology (Ex. 30–4607). Caterpillar recommended that the standard not require the employer to assess additional controls unless a new MSD occurs.

Federal Express argued that, because an employee must handle every package at some point in the delivery process, complete elimination of human involvement cannot be achieved in its line of work (Ex. 32–208). In addition, Federal Express believes that it has reduced manual handling at its facilities as much as it can and, thus, is already at the limits of technological feasibility.

Keller and Heckman, L.L.P. believed that the proposed standard would require employers to research and develop technology to meet the proposal's compliance endpoint (Ex. 500–221). The law firm argued that the approach taken by the proposal was legally indistinguishable from the research and development requirement that the Third Circuit invalidated in *American Iron & Steel Institute* v. *OSHA,* 577 F.2d 825, 838 (3rd Cir. 1978). In that case, the Court held:

29 U.S.C. § 665(b)(5) grants authority to the Secretary to develop and promulgate standards dealing with toxic materials or harmful agents ''based upon research, demonstrations, experiments, and such other information as may be appropriate.'' Under the same statutory provision the Secretary is directed to consider the latest scientific data in the field. As we have construed the statute, the Secretary can impose a standard which requires an employer to implement technology ''looming on today's horizon,'' and is not limited to issuing a standard solely based upon technology that is fully developed today. Nevertheless, the statute does not permit the Secretary to place an affirmative duty on each employer to research and develop new technology. Moreover, the speculative nature of the research and development provisions renders any assessment of feasibility practically impossible. In holding that the Secretary lacks statutory authorization to promulgate the research and development provision, we note in passing that we need not reach petitioners' challenge to the provision as fatally vague. Accordingly, we hold the research and development provision of the standard to be invalid and unenforceable.

[*American Iron & Steel Institute* v. *OSHA,* 577 F.2d 825, 838 (3rd Cir. 1978) as quoted by Ex. 500–221]

Paul, Hastings, Janofsky, and Walker LLP stated that the preamble to the proposal indicated that the standard would be technology forcing:

The agency's impossibly burdensome definition of technological feasibility would make compliance * * * virtually impossible. OSHA asserts that a hazard control methodology is technologically feasible even if it is not currently available.

Thus, OSHA could issue citations and civil penalties to a small employer for failing to implement non-existent equipment that ''can be developed by improving existing technologies'' or that is ''on the horizon of technological development.'' 64 FR at 65823. [Ex. 30–3231]

The National Solid Wastes Management Association (Ex. 32–234) argued that OSHA's description of ''technological feasibility'' would make compliance with the proposed endpoint virtually impossible:

OSHA asserts that a hazard control methodology is technologically feasible even if it is not currently available. Thus, OSHA could issue citations and civil penalties to a small solid waste industry employer for failing to implement non-existent equipment that ''can be developed by improving existing technologies'' or that is ''on the horizon of technological development.'' 64 FR at 65823. [Ex. 32–234]

The American Transportation Association argued that OSHA could conclude that the employer had not gone far enough to control hazards even in the absence of continued MSDs (Ex. 30–4465). In support of this argument, the Association stated, ''if MSD symptoms persist, even on an occasional basis, an employer must continue to implement additional measures until it has exhausted all feasible controls.''

LPA, Inc., and others contrasted the types of controls OSHA has required when it cited employers for failing to abate ergonomic hazards under the general duty clause with the types of controls the Agency has stated that it will accept under the proposed rule (see, *e.g.,* Exs. 30–494, 32–208). LPA argued as follows:

Once a hazard is identified, an employer must implement ''feasible'' controls to try to eliminate it. A feasible control is one that is already being used elsewhere in the same job, can be adapted for the job, or ''is on the horizon of technological development.'' [Footnote omitted] OSHA insists that the available controls to fix hazards are usually neither complex nor costly. Although such controls may be accomplished through physical changes to the job, changes in work practices, or training in proper work techniques, [Footnote omitted] the standard expresses a preference for physically redesigning the job.

When citing ergonomics hazards under the general duty clause, however, OSHA has often required substantial physical changes, such as completely redesigning an assembly line and rebuilding the cab of a large crane. In many cases, these engineering controls favor automation and result in lost jobs. [Ex. 30–494]

The AFL–CIO noted that requiring employers to eliminate ergonomic hazards or implement controls to the extent feasible was similar to the approach OSHA uses in many other standards (Ex. 32–339). The union held that any incremental abatement process included in the final standard must have as its goal and endpoint the elimination of MSD hazards or the reduction of MSD hazards to the extent feasible.

The final rule contains an endpoint that would recognize that an employer is in compliance when he or she has done all that is feasible to reduce MSD hazards. This endpoint is statutorily driven. The OSH Act does not give the Agency the authority to require controls that are not capable of being done. This endpoint places a technological and financial limit on how far an employer must go in controlling MSD hazards.

As demonstrated by its feasibility analyses described in Chapter 3 of the Economic Analysis OSHA believes that most employers will be able to reach one of the other two endpoints (control MSD hazards or reduce MSD hazards in accordance with or to levels below those in the hazard identification tools in Appendix D) using existing technology at a cost that is economically feasible. The third endpoint, control MSD hazards to the extent feasible, is not technology-forcing in the sense feared by some commenters. As discussed earlier, what is feasible under the standard is determined by the limits of current technology and knowledge, not the potential for future technology.

Furthermore, OSHA believes that many of the comments on the corresponding compliance endpoint in the proposal were founded on the impression that the proposed rule would have required employers to eliminate MSDs from the workplace subject only to the limits of feasibility (see, *e.g.,* Exs. 30–3231, 30–3347, 30–3750, 30–4465, 32–211, 32–234). The language of the final rule's compliance endpoint makes it clear that this is not the case. The feasibility compliance endpoint in the final rule supplements the other two and ensures that no employer is required to go beyond the limits of feasibility.

OSHA has addressed the concerns of the American Health Care Association that employers would be forced to continually review new technology (Ex. 30–2987). Paragraph (k)(1)(iii) of the final rule requires employers to assess whether additional feasible controls are available every 3 years. This provision limits the frequency with which an employer would need to review technology, and the assessment could easily be done as part of the overall program evaluation. The Agency will be providing information on available control technology on its Web site and updating this information periodically. Employers should, however, check other sources of information to ensure that they have not overlooked new hazard controls that are appropriate for the MSD hazards in their workplaces.

The final compliance endpoint does not require employers to perform research and development to extend the limits of technological feasibility. As explained above, MSD control technology is feasible if the control method is available or adaptable to the employer's specific circumstances. Employers are not required to perform research on MSD control methodology or develop new technology to abate the MSD hazards in their workplaces.

e. *Comments that the proposed rule would force employers to automate jobs out of existence.* Some rulemaking participants argued that the ergonomics standard will lead to the elimination of jobs (see, *e.g.,* Exs. 30–1616, 30–3845, 30–3956, 30–4185; Tr. 5701). These commenters asserted that employers would act to reduce MSD hazards in the workplace by automating jobs out of existence, shifting jobs overseas, or converting full-time jobs to part-time to reduce exposure (see, *e.g.,* Exs. 30–3845, 30–3956). Several rulemaking participants were concerned about the feasibility of automating certain jobs (see, *e.g.,* Exs. 30–2208; Tr. 18033). For example, the Center for Office Technology stated:

To eliminate the hazard one must automate the work environment thus eliminating any exposure. Those are not OSHA's words but those are the examples OSHA gives (Fed. Reg. Page 65832). And in the case of the office, OSHA suggests that the only way an employer of office workers has eliminated the hazard is to use a voice-activated computer to eliminate highly repetitive motions. Here is where OSHA's definition of feasible falls apart for the office industry. Is it feasible to have voice recognition for computer input when for many applications, given the state of the technology, it is neither effective nor an adequate or available solution? Voice activation technology has come a long way, however, this technology is not at a point which it can be used for all

applications. To use a technology that is still evolving and has limited effectiveness in some applications as an endpoint leaves employers in a never ending cycle with no true solutions. [Ex. 30–2208]

OSHA does not believe that this ergonomics standard will result in the elimination of a significant number of jobs through automation or in the conversion of full-time jobs to part-time. Employers use automation to promote efficiency and increase productivity, and reduction of MSD hazards is often a byproduct. The specific concern expressed by the Center for Office Technology is unfounded. OSHA referred to a voice—activated computer as an example of a control that would eliminate a repetitive motion hazard but did not mean to imply that all computer input would henceforth need to be done using voice-activation software. Appendix D makes clear that is not the case.

Automation for the sole purpose of reducing MSD hazards is typically unnecessary. Testimony by the United Auto Workers indicated that, in one of their programs covering about 4400 employees and involving over 1000 processes, only one problem job was fixed by automation (Tr. 14797). In addition, Mr. David Alexander (Tr. 2564), one of OSHA's expert witnesses with extensive experience in ergonomics, testified that most ergonomic solutions were low cost:

> In my work, I found that about half of the projects cost less than $500 and can be done on a standard work order without the need for detailed justification. Perhaps that is why we do not hear about many of these low-cost solutions. Only a third of the projects need to cost more than $1,000. In other words, an ergonomics project is likely to cost, two times out of three, less than $1,000 and usually can fit within most budgets. [Tr. 2564]

These control methods do not approach the cost of automation. Consequently, simple economics will keep most employers from automating jobs simply to control ergonomic hazards. Mr. Alexander also stated that for a single set of risk factors as many as five to ten different solutions can be developed and employers should not be forced to convert full-time jobs to part-time. If reduction of exposure time is a control an employer selects, rotating employees among different jobs would normally be a cost-effective alternative to the use of part-time workers to replace full-time employees.

4. Comments on Whether the Proposed Compliance Endpoint of Eliminating MSD Hazards Is Illusory Because MSDs Cannot Be Eliminated

Some rulemaking participants criticized the final means of compliance, ''eliminating MSD hazards'' (see, *e.g.*, Exs. 30–323, 30–1107, 30–1722, 30–3845; Tr. 8328). For example, the US Chamber of Commerce stated that activities that the Agency characterizes as MSD hazards are ''universal activities of life, both in and out of the workplace, that can never be completely eliminated.'' The Chamber also noted that certain risk factors may pose MSD hazards to some employees but not to others due to their unique susceptibilities and prior medical history. Thus, the Chamber concluded, ''Without knowing how an innumerable list of confounding factors might coalesce to cause an MSD in a given individual, neither OSHA nor an employer can ever say whether a significant risk of harm exists and, short of eliminating the job altogether, it will be impossible to say when all possible ergonomic ''risks'' have been eliminated. [Ex. 30–1722]'' Other rulemaking participants made similar arguments (see, *e.g.,* Exs. 30–297, 30–323, 30–2208, 30–3765, 30–3845, 30–3934, 30–4185; Tr. 2960, 5342). These commenters said that nonwork-related factors also cause MSDs and that some MSDs will continue to occur even after employers control all work-related hazards. For example, the Forum for a Responsible Ergonomics Standard stated that employers cannot control the predisposition of their employees to contract MSDs (Ex. 30–3845). The Forum asserted that women are susceptible to carpal tunnel syndrome for a variety of reasons, including because they have smaller wrists and greater fluid retention. Similarly, Metz Baking Company stated: ''* * * OSHA's proposal essentially forces companies into the pursuit of continuous efforts to reconfigure their workplaces and methods of operation down to a level that is without physical stressors for the most vulnerable of its employees [Ex. 30–323].'' Some rulemaking participants noted that the standard did not hold employees accountable for their own behavior on and off the job (see, *e.g.,* Exs. 30–3355, 30–3723; Tr. 8328). For example, Mr. Perry Ozburn, the chairman of the International Warehouse Logistics Association, recounted a case in which his company had to pay benefits to an employee who Mr. Ozburn believed was injured off the job (Tr. 8328).

Mike Redman of the National Soft Drink Association argued the fact that employees in certain jobs will experience MSDs despite the best efforts of their employers (Tr. 2960). He reasoned that, because the probability of an MSD occurring in such jobs is always 100 percent, the employer will not be able to materially reduce the likelihood that an injury will occur.

Once again, the premise of these comments is that the proposed standard would have required employers to eliminate MSDs from the workplace. As noted earlier, the final rule's compliance endpoints stop short of this and provide clearly defined goals. OSHA realizes that employers cannot prevent all MSDs. In addition, the final rule, like the proposal before it, includes a note that the occurrence of an MSD is not, in and of itself, a violation of the hazard control endpoint.

5. Comments on Whether Some MSD Hazards Are Beyond the Employer's Control

Some rulemaking participants, particularly those representing the ambulance service, solid waste, and moving and storage industries, were concerned that employees were exposed to ergonomic hazards that were out of the employer's control (see, *e.g.,* Ex. 30–3686, 30–3845; Tr. 8140, 14957, 18030). For example, Mr. Ron Thackery, representing the American Ambulance Association, testified that not only were the lifting hazards faced by ambulance crews beyond the control of employers but that there were no feasible control measures that his industry could use to meet the compliance endpoint required by the proposed standard (Tr. 15017).

The final rule's compliance endpoint recognizes that some aspects of an employer's hazard control efforts may be limited by the availability of feasible controls. To the extent that the MSD hazards an employee faces are completely out of the employer's control, the final rule does not require the employer to control them. (For an analysis of the comments on the feasibility of controls in various jobs, see the discussion of technological feasibility in the Economic Analysis section later in the preamble.) For example, for paramedics responding to an automobile accident, the employer would have no control over the weight of the accident victims or their positions at the accident scene. These factors are highly variable and cannot be controlled by the employer. However, there are certain administrative and engineering controls that are available and, to the extent they can be used, the employer is required to implement them. For

example, work rules (with associated training) can assure that employees minimize the risk involved in moving accident victims.

When work rules are used as an administrative control of MSD hazards, the employer is obligated to institute an adequate work rule, train employees in it, take steps to find violations, and enforce the rule uniformly. If the employer has done those things and an employee violates that rule without the employer's knowledge, then the employer will not be cited for that violation (see section III.C.8.c(1) of OSHA's Field Inspection Reference Manual, CPL 2.103.). The courts and OSHA Review Commission do recognize a defense of unpreventable employee misconduct. See, *e.g., D.A. Collins Constr. Co.* v. *Secretary of Labor,* 117 F.3d 691 (2nd Cir. 1997). Thus, the fears expressed by Guilford Mills (Ex. 30–2990) and the Oregon Dental Association (Ex. 32–233) that employers would be held responsible for unpreventable violations of work rules by their employees is unfounded.

7. Whether the Proposed Incremental Abatement Process Endpoint is Appropriate

The proposed incremental abatement process (§ 1910.922) would have allowed employers to test solutions in a problem job, so long as they would result in some hazard reduction and wait and see whether an additional MSD occurred before trying out further controls.

This proposed provision drew substantial comment on both sides. Many commenters objected to it as written because they believed it would permit employers to delay implementing controls that were needed to protect workers. The AFL–CIO recommended changing the provision to avoid this problem.

> The AFL–CIO believes that any incremental abatement process included in the final standard must have as its goal and endpoint the elimination of MSD hazards or the reduction of MSD hazards to the extent feasible. Employers can eliminate or reduce these hazards incrementally, focusing first on the high duration, high frequency and high intensity risk factors identified in the job analysis. Employee reports of MSDs or symptoms can and should be used to help set priorities for action and to help determine which jobs need further attention, but they should not be the endpoint for when and whether an employer has instituted sufficient controls.
>
> The final standard must also set a compliance deadline for implementing all feasible controls through the incremental abatement process. OSHA should make clear that the same compliance deadlines for permanent controls (*i.e.,* within three years during the startup period and within one year thereafter) apply, regardless of the abatement process an employer chooses to utilize. [Ex. 32–339]

The International Brotherhood of Teamsters stated that the incremental abatement of hazards would be acceptable within a framework of continuous ergonomic improvement that incorporated symptom surveillance, reaction to ergonomic complaints, active risk factor analysis, and continuing training (Ex. 500–207). The IBT also believed, however, that the final ergonomics standard must specify time frames and deadlines for the incremental abatement process.

Other rulemaking participants were also concerned about the lack of a time limit between incremental control steps (see, *e.g.,* Exs. 32–111, 32–210). The United Steelworkers of America suggested that OSHA provide additional guidance to assist employers in determining how long they may wait for an injured employee's condition to improve before implementing additional control measures (Ex. 32–111). The United Food and Commercial Workers International Union also recommended that the incremental abatement process have the same endpoint as the other two compliance options (Ex. 32–210).

On the other hand, the Integrated Waste Services Association urged the Agency to allow for flexibility in this regard, stating:

> The timing of the incremental abatement process will require it to be very specific to the situation. Consequently, standardized measures of timeliness would be ineffective and impractical. The employer should be permitted to gauge its own unique time frame for each and every WMSD. [Ex. 32–337]

In its post-hearing submission (Ex. 500–218), the AFL–CIO criticized the provision as allowing an employer to implement minimal controls for a problem job until a new injury occurs. According to the AFL–CIO, ''[r]equiring employers only to 'significantly reduce the likelihood that covered MSDs will occur,' and then allowing them to avoid further intervention until another injury occurs is an unacceptable, unprotective compliance endpoint that is totally at odds with the language and purpose of the Act.'' The United Auto Workers expressed similar concerns. ''The plain meaning of 'incremental abatement' is that all feasible controls will not be implemented in the first instance. Instead, the employer is permitted to implement some but not all feasible controls, and then wait for a second employee to be injured before going the rest of the way.'' (Ex. 32–185).

Other rulemaking participants supported the proposed incremental abatement process (see, *e.g.,* Exs. 30–434, 32–450; Tr. 14854). For example, Ms. Barbara Fritz testified that she used an incremental process of applying a control measure and seeing if it works in her efforts to abate ergonomic hazards (Tr. 14854). Monsanto Company stated:

> We agree that using an ''incremental abatement process'' is a valid method of dealing with physical stresses. In some instances you implement a potential solution to a problem and find that once in place additional improvements are either necessary or possible. It is also possible that from a budgeting standpoint you may not be able to implement the full-scale solution until you can obtain the necessary capital, so you implement partial solutions until capital is available. [Ex. 30–434]

NIOSH (Ex. 32–450) also supported the incremental abatement process in the proposed standard:

> We agree that control of MSD hazards can be appropriately achieved through the use of the incremental hazard abatement process proposed in Section 1910.922, allowing employers to implement controls in increments in order to understand which solutions work among all potentially necessary controls, and to implement only those controls that are necessary. We believe that it is essential and standard practice in many existing ergonomic programs for the routine reassessment of jobs in which initial control measures fail to reduce the severity or occurrence of MSDs. This reassessment should trigger implementation of additional feasible control measures. This process also allows employers to select the best solutions to eliminate or materially reduce the MSD hazard most efficiently, and to periodically check for new controls capable of further material reduction of the hazard. [Ex. 32–450]

Having considered the views expressed by the commenters, OSHA concludes that it is not necessary to include a separate provision in the standard on incremental abatement as the time frames for implementing controls allow employers to follow an incremental abatement process without a separate provision to that effect. The proposed incremental abatement provision recognized that the most cost-effective approach to reducing or eliminating MSD hazards is at times an incremental one. Employers may try some basic, inexpensive controls and see how well they work in reducing hazardous exposures before determining whether additional controls are needed. The proposed incremental abatement process was intended to make clear that employers are permitted to follow such an approach. OSHA has concluded, however, that it is not necessary to include a separate provision about

incremental abatement in the standard. The standard allows employers up to 2 years (4 years initially) to control problem jobs, and these time frames are sufficiently long to enable those employers who wish to do so to follow an incremental abatement approach. A separate provision on incremental abatement would therefore be redundant.

Elimination of the incremental abatement provision also accommodates the concern expressed by the AFL–CIO and UAW that the provision allowed employers to implement minimal controls and wait until additional MSDs occur before completing abatement. Under the final standard, once an employer has identified a problem job, it must now attain one of the compliance endpoints for all employees in that job within the time frame set out by the standard. Thus, while the final standard allows incremental abatement within its time frames, once a problem job has been identified that the employer must control, the employer's abatement obligation does not depend on the occurrence of additional MSDs.

7. Whether the Final Ergonomics Standard Should Allow Employers to Prioritize the Control of MSD Hazards

Some rulemaking participants were concerned that the proposed compliance endpoints limited the ability to prioritize the control of MSD hazards (see, *e.g.,* Ex. 30–3813; Tr. 3135, 14722). For example, PPG Industries believed that the incremental abatement process outlined in the proposal limited the employer's ability to prioritize hazards (Tr. 3135).

Sean Cady, representing Levi Straus and Company, testified that the proposal did not provide sufficient guidance for the employer to prioritize jobs for the analysis and control of hazards:

> Well I would say first that we're here today to talk about our ergonomic program and what we've learned over the last 10 years of having a formal program in place. But one of the concerns that comes to mind is the proposal doesn't seem to provide enough guidance on how an employer should prioritize jobs for things like hazard analysis and job modification and control if more than one job is triggered at the same time. [Tr. 14722]

The United Auto Workers believed that it is important to prioritize jobs and hazards for control (Ex. 32–185; Tr. 8102–8104). The UAW suggested that the employer could use tools such as the NIOSH Lifting Equation, Snook and Ciriello Push-Pull tables, and various checklists, to identify which job elements and risk factors are most important (Ex. 32–185). The union recommended that employers be required to abate all risk factors classified as high priority but be allowed to abate other MSD hazards at a later time. The UAW argued that this was the proper way for employers to materially reduce risk factors under the incremental abatement process.

In its post-hearing submission, the AFL–CIO recognized that some employers may have difficulty in meeting the proposed rule's compliance endpoints by the deadlines contained in the proposal (Ex. 200–218). To remedy this problem, the AFL–CIO suggested that the final ergonomics standard allow employers an additional year to meet the compliance endpoint if the employer:

(1) Has conducted the job hazard analysis required by the standard,

(2) Has identified MSD hazards,

(3) Has consulted with employees and their designated representatives, and

(4) Has developed an action plan for eliminating MSD hazards.

According to the union, the action plan should prioritize the control of MSD hazards and provide for measurable reductions in exposure to those hazards, and the employer should be required to implement controls in accordance with the action plan and evaluate whether the controls have reduced exposures.

The AFL–CIO reasoned that its recommendation, which was consistent with other OSHA standards, would provide employers with sufficient time to eliminate MSD hazards without unnecessarily exposing employees to injury:

> The concept of an action plan or compliance program to set forth the process and means by which an employer will achieve compliance is an established practice under OSHA standards. The majority of OSHA's health standards, including standards on lead (1910.1025), cadmium (1910.1027), arsenic (1910.1018), and methylene dianaline (MDA) (1910.1050) contain a requirement for the establishment and implementation of a written compliance program.
>
> Similarly, a number of OSHA standards have recognized that in some industries or some establishments it may not be possible to achieve the control endpoint by the compliance date established for other industries and employers. In these cases, OSHA has on occasion included provisions to extend the compliance date for the implementation of controls.
>
> Under the arsenic standard, employers who were unable to achieve compliance with the PEL through engineering controls and work practices by the compliance date of December 1, 1979, were required to include in their compliance plan an analysis of the effectiveness of controls, and were required to install engineering controls, and institute work practice controls on the quickest schedule feasible [1910.1018(g)(2)(ii)(F)].
>
> The AFL–CIO believes that the provision of a one year extension in the abatement date accompanied by the development and implementation of an action plan is an appropriate means to address more complex hazards and is consistent with the practice under other standards. We recommend that such a provision be included in the final standard. [Ex. 500–218]

OSHA acknowledges that some employers will have difficulty controlling MSD hazards in all problem jobs within the deadlines that would have been imposed by the proposed standard—permanent controls would have had to be in place within 3 years after the effective date initially and, if the initial compliance deadline has passed before an MSD occurs, within 1 year of the incident. To alleviate this problem, the final ergonomics standard gives employers an additional year to implement permanent controls—permanent controls must be in place within 4 years after the effective date initially and, if the initial compliance deadline has passed before an MSD occurs, within 2 years after the employer determines that the job meets the Action Trigger. (These deadlines and the reasoning behind them are explained in more detail in the summary and explanation for paragraph (x), later in this section of the preamble.)

OSHA is not, however, providing a prioritization requirement in the final rule. With the extended deadlines for the implementation of permanent controls, employers will have sufficient time to install all controls necessary to meet the final rule's compliance endpoint.

Employers are free to prioritize the installation of permanent controls within the compliance deadline for MSD problem jobs. There are many ways of assigning priorities to jobs. Priorities can be assigned on the basis of risk, severity, cost, or other reasons. As long as all required permanent controls are in place by the compliance deadline, the Agency does not believe it is necessary or appropriate for the standard to specify a prioritization schedule. Consequently, the final rule contains no requirements on prioritization.

Paragraph (l)—What Kinds of Controls Must I Use to Reduce MSD Hazards?

Paragraph (l) of the final rule requires the employer to use feasible engineering, work practice, or administrative controls, or any combination of them, to reduce MSD hazards in problem jobs. The standard also allows employers to use personal

protective equipment (PPE) to supplement these controls but stipulates that PPE may not be used alone unless other controls are not feasible. In addition, the standard requires any PPE that is provided to be furnished to employees at no cost.

This paragraph of the standard is almost identical to the parallel proposed provision, with one exception. A footnote to this paragraph in the proposal would have prohibited the use of back belts/braces and wrist braces/splints as PPE; this footnote has been deleted from this paragraph of the final rule. As explained below, OSHA believes that evidence in the record suggests that back belts, in some limited applications, may help to reduce MSD hazards. However, back belts, like other PPE, may not be used alone if other controls are feasible. Wrist splints, wrist braces, and back braces, which are post-injury devices used to speed rehabilitation, are not considered PPE for the purposes of this standard.

Paragraph (l)(i)—Feasible Controls

Paragraph (l)(i) of the final standard mandates the use of feasible controls (engineering, work practice, and administrative controls) or any combination of them to control or reduce MSD hazards in problems jobs. This paragraph also states that engineering controls, where feasible, are the preferred method of control. This paragraph of the final rule is essentially unchanged from the proposal. OSHA is allowing employers this flexibility in the choice of controls because the Agency's experience and information in the rulemaking record indicates that these control approaches have been effective in contributing to reductions in the number and severity of workplace MSDs. In addition, OSHA believes that the broad range of jobs to which the standard will apply, and the great variation in workplace conditions covered, make compliance flexibility essential.

The final standard defines engineering controls as controls that physically change the job in a way that controls or reduces MSD hazards. Examples of engineering controls that are used to address ergonomic hazards are workstation modifications, changes to the tools or equipment used to do the job, facility redesigns, altering production processes, and/or changing or modifying the materials used. Engineering controls range from very simple to complex: from putting blocks under a desk to raise the work surface for a taller-than-average worker to providing a lumbar support pillow or rolled-up towel to a video display unit (VDU) operator, to redesigning an entire facility to enhance productivity, reduce product defects, and reduce workplace MSDs.

When choosing an engineering control to address a particular ergonomic problem, employers often have many choices, depending on how much they wish to spend, how permanent a solution they seek, how extensive a production process change they need, and employee acceptance and preference (see the discussion of control approaches in the summary and explanation for paragraph (m)). For example, as MacLeod (Ex. 26–1425) points out, an employer whose VDU operators are experiencing neck and shoulder problems has many options available, including the following:

- Raising the height of the monitor by putting it on phone books, building a monitor stand, buying an adjustable monitor stand, buying an adjustable wall-mounted monitor stand, or buying an adjustable desk-mounted monitor stand;
- Putting the desk on blocks; or
- Providing an adjustable-height desk or workstation.

Work practice controls involve changes in the way an employee does the job. They are defined by the standard as changes in the way an employee performs the physical work activities of a job that reduce exposure to MSD hazards. Work practice controls involve procedures and methods for safe work. Examples of work practices that reduce the potential for exposure to ergonomic risk factors are the use of neutral positions or postures to perform tasks (keeping wrists straight, lifting close to the body), use of two-person lifts when mechanical lifts are not available, and the observance of micro-breaks as necessary to minimize muscle fatigue. In the context of ergonomic programs, work practice controls are essential, both because they reduce ergonomic stressors in their own right and because they are critical if engineering controls are to work effectively. For example, workers need to be trained to use a power grip rather than a trigger grip if a new tool is to be successful, and they need to know how to adjust an ergonomically designed chair properly if it is to substantially reduce the risk of neck disorders, shoulder tendinitis, or another type of MSD. Work practices, like learning to vary job activities during the day (*e.g.,* moving from filing to sorting mail to using the computer and back again) can often reduce the magnitude and duration of exposure to the relevant risk factor sufficiently to make MSDs unlikely. To be effective, the culture at the workplace and supervisory support and reinforcement are necessary to ensure that safe work practices are routinely observed.

Administrative controls are work practices and policies implemented by the employer that are designed to reduce the magnitude, duration, and/or frequency of employee exposure to risk factors by changing the way work is assigned or scheduled. Examples of administrative controls that are used in the ergonomics context are employee rotation, job enlargement, and employer-initiated changes in the pace of work.

Administrative controls have been effective in addressing MSD hazards in a number of cases. For example, one case study cited in the Benefits chapter (Chapter IV of the Final Economic Analysis) describes a lift team approach that has been effective in reducing work-related back injuries among nursing personnel in a long-term care facility for the elderly (Ex. 26–1091). The table of ergonomic program and intervention case studies in Section VI shows dozens of examples of the successful use of administrative controls, either alone or in combination with other controls.

However, administrative controls must be used carefully if they are to provide effective protection to employees. A well-known ergonomics book, MacLeod's ''The Ergonomic Edge,'' cautions:

> * * * job rotation is only beneficial if the tasks involve different muscle-tendon groups or if the workers are rotated to a rest cycle * * *. Furthermore, job rotation alone does not change the risk factors present in a facility. Although job rotation may have beneficial effects, engineering changes should remain the goal of the ergonomics program (Ex. 26–1425).

OSHA agrees, and paragraph (l)(1) notes, that engineering controls are the preferred method of controlling MSD hazards in cases where these controls are feasible. In contrast to administrative and work practice controls or personal protective equipment (PPE), which traditionally have occupied lower tiers of the hierarchy, engineering controls fix the problem once and for all.

Many commenters agreed that engineering controls are generally superior to other controls, *i.e.,* administrative controls, work practices, or personal protective equipment (see, *e.g.,* Exs. 26–1487, 26–1428, 26–1424, 26–2; 26–1426, 26–1425, 26–1408; and 26–3). For example, a recent ergonomics text states:

> Ergonomic hazards can be effectively eliminated by introducing engineering